METAL INDUSTRY

WITH WHICH ARE INCORPORATED

ALUMINUM WORLD ◆ COPPER AND BRASS

BRASS FOUNDER and FINISHER

ELECTRO-PLATERS REVIEW

VOL. 31 NEW YORK, FEBRUARY, 1933 No. 2

The X-Ray Analysis of Electrodeposited Alloys

By CHARLES W. STILLWELL

Department of Chemistry,
University of Illinois

A Discussion of the Principles Involved and the Advantages of the Method; and a Report of a Study of Electrodeposited Silver-Cadmium Alloys Which Illustrates the Type of Information That May Be Obtained

FROM the practical standpoint the physical structure of an alloy is as important as its chemical composition since it determines to a great extent the physical properties (particularly hardness, ductility, melting point, etc.) of the alloy. No data are available to show the relation of the structure of an electro-deposited alloy to its chemical composition and the current density and temperature at which it is deposited. It is the purpose of this article to point out the value and convenience of the X-ray method of analysis for determining both the chemical composition and the physical structure of electrodeposited alloys. This can best be accomplished by reporting in some detail the results of a study of the structure of silver-cadmium alloys plated on copper.

Due to a realization of the practical advantages of electrodeposited alloys the number of binary alloys which may be successfully plated has increased considerably during recent years. While brass and a few other alloys have been plated for many years there has been little effort to study systematically the conditions affecting the composition of the plate. Within the past two years publications by Stout and his co-workers[1] and by Fink[2] have furnished valuable data concerning the effect of both composition, temperature, current density and stirring on the composition of an alloy plate. With the help of such data it has become possible to predict the approximate chemical composition of an electrodeposited alloy. As is well known, when two metals are melted together to form an alloy, there are three possible types of alloy which may be formed—a mixture of the two metals, a solid solution or an intermetallic compound. Because metals react this way when melted together, however, is no sign that they will do the same thing when deposited together from a plating bath. In the former case there is usually a good opportunity for them to become well annealed, while electroplating often has the same effect as sudden chilling and leaves the alloy in a metastable condition.

X-ray diffraction methods lend themselves particularly to the determination of the physical structure of electrodeposited alloys. The principles involved in the study of metals by this method have been set forth by several authors[3] and need not be repeated in detail. The value of the method lies in the fact that when a beam of X-rays is passed through a crystal or through many small crystal grains, there is produced on a photographic plate or film a pattern which is characteristic of the arrangement of atoms in that particular crystal. Different crystal forms produce different patterns.

The experimental procedure is simple. A beam of X-rays is defined by a system of slits; the specimen is set so that the electrodeposit intercepts this beam and the diffraction pattern produced is recorded on a photographic film. Various details of the apparatus such as wave length of X-rays used, form of camera, shape of specimen, are usually varied to fit specific problems. For a given problem one particular set of conditions will give the most satisfactory results.

The interpretation of the pattern obtained may or may

[1] Cu-Ni, Stout, Birch and Langsdorf: Trans. Electrochem. Soc. *57*, 113 (1930).
Fe-Ni, Stout and Carol: Trans. Electrochem. Soc. *58*, 357 (1930).
Ag-Cd, Stout and Thummel: Trans. Electrochem. Soc. *59*, 337 (1930).
Zn-Cd, Stout and Faust: Metl. Ind. (N. Y.) *28*, 381 (1930).
Stout and Kowarsky: ibid. *29*, 297 (1931).

[2] Ni-Co, Fink and Lah: Trans. Electrochem. Soc. *58*, 373 (1930).
Ag-Cd, Fink and Gerapostolou: Metal Ind. (N. Y.) *28*, 519, 562 (1930).
Pb-Tl, Fink and Conard: ibid. *29*, 116 (1931).

[3] See, for example, G. L. Clark: "Applied X-Rays," 1927, McGraw-Hill, N. Y.

not be a comparatively simple matter. In Figure I are shown diagrammatically patterns characteristic of the three types of alloys which may be formed; namely, a mixture, a solid solution and a compound. B is the pattern for pure silver, C for pure cadmium. If these two metals were plated out independently and the alloy were composed of a mixture of the two, the pattern D would result. It consists of the patterns of the two pure metals superimposed and indicates that these two different types of crystals are mixed together without influencing each other. From the standpoint of crystal structure a solid solution of cadmium in silver results when atoms of cadmium actually replace silver atoms from various positions in the lattice of the silver crystal. Since the cadmium atom is larger than a silver atom, the lattice is expanded by the substitution. This causes the lines on the pattern to be shifted more or less uniformly. Figure I (A) is typical for any solid solution. The pattern is still that

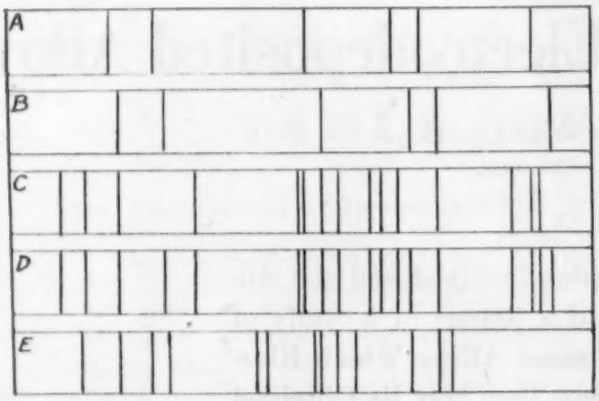


FIGURE 1.
Schematic Diffraction Patterns for the Three Types of Alloys. A = Solid solution; B = Pure silver; C = Pure cadmium; D = Mixture (Silver + Cadmium); E = Compound.

of silver, but the lines have been shifted due to the substitution of cadmium.

Pattern E is produced by an intermetallic compound of silver and cadmium. The arrangement of lines corresponds neither to the superimposed silver and cadmium patterns characteristic of a mixture, nor to the shifted pattern characteristic of a solid solution. It is unique, and must therefore be produced by an entirely new crystal form.

This, in brief, is the reasoning followed in the X-ray analysis of the structure of an electrodeposited alloy. The identification of the various compounds formed or the actual determination of their crystal structure is a more laborious process but can usually be done. Complications often arise, as will be illustrated in the data reported below, when there are present in the alloy mixtures of two or more compounds or solid solutions rather than merely a mixture of the two pure metals.

The Structure of Electrodeposited Ag-Cd Alloy

This alloy was chosen for investigation because it is typical of a large number of the more complicated binary systems.

The alloys were plated from a cyanide bath, using the formulas recommended by Stout and Thummel.[4] The composition of the plate is affected by the Ag/Cd ratio of the bath and by the current density and temperature used for plating. An X-ray study of thermal alloys of Ag-Cd has shown the existence of five different alloy phases dependent upon the composition as follows:[5]

Percent Ag.	Phase
0-4	η — a solid solution of Ag in Cd
4-17	$\eta + \epsilon$
17-31	ϵ — a compound $AgCd_3$
31-34	$\epsilon + \gamma$
34-46	γ — a compound Ag_5Cd_8
46-49	$\gamma + \beta$
49-51	β — a compound AgCd
51-55	$\beta + \alpha$
55-100	α — a solid solution of Cd in Ag

There may therefore be five different forms of crystals in the Ag-Cd alloys, each of which will give a different diffraction pattern.

Effect of Plate Composition on the Crystal Structure

A series of alloys was deposited in which the composition was varied by altering the Ag/Cd ratio of the bath, the temperature and current density remaining constant at 27° C. and 1.1 amps/dm² respectively. The baths were not agitated. The cathode, a strip of copper of 40 cm² was placed between two duriron anodes, 5 cm from each.

In Table I is shown the relation between the Ag/Cd ratio of the bath and the percent Ag in the plate. Table II is a comparison of the crystal structure of the electrodeposited alloy with that of a thermal alloy of the same composition. In each case the predominant phase in the electrodeposited alloy has been placed furthest to the left.

TABLE I. RELATION BETWEEN COMPOSITION OF BATH AND COMPOSITION OF PLATE

Ag/Cd in baths	Percent Ag in Plate	
.100	18.5	C. D. = 1.1 amp/dm²
.137	23.4	Temp. = 27° C.
.300	47.4	No agitation
.350	52.0	
.700	69.0	

TABLE II. RELATION BETWEEN COMPOSITION AND STRUCTURE OF SILVER-CADMIUM ALLOYS

C.D. = 1.1 amps/dm²; temperature = 27° C. No agitation.

Electrodeposited	Percent Ag	Thermal
η, ϵ	4.0	η
ϵ, γ, β	22.0	ϵ
γ, β	45.0	γ, β
β, α	54.0	α, β
α	69.0	α

The actual diffraction patterns from which this analysis was made are shown in Figure II.

All of the above alloy plates adhere very well to the base metal. They show no tendency to peel even after bending enough to break the copper base. They are not uniformly bright, nor of the same color when plated. They may be buffed bright, but their resistance to tarnish

[4]Stout and Thummel: Trans. Electrochem. Soc. *59*, 337 (1930).

[5]Astrand and Westgren: Z. anorg. allgem. Chem. *175*, 90 (1928).

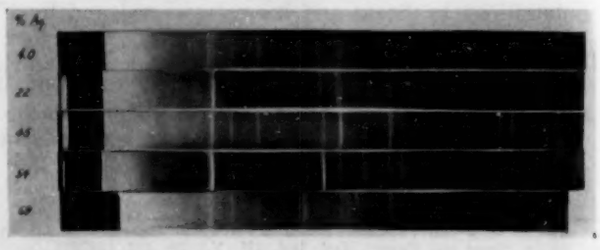


FIGURE 2.
Diffraction Pattern for the Silver-Cadmium Alloys Reported in Table II.

is not uniform. This tarnish resistance has been studied previously. [6]

It is evident from Table II that approximately the same crystalline intermetallic phases exist in the electrodeposited alloys as are present in thermal alloys of the same composition.

Effect of Current Density on Structure of Deposit

It is a little difficult to conceive of Ag and Cd atoms being deposited independently on a copper plate and then combining after they have been deposited to form solid solutions or compounds. Usually such a reaction between solids occurs very slowly, if at all. It was to be expected that the rate of deposition might in some measure affect this combination, and the relation between crystal structure and current density has therefore been studied. It has already been shown that increasing the current density increases the percent of cadmium plated from a bath of given composition.[6] In Table III a few typical values are listed to show the effect of current density upon the composition of the deposits.

TABLE III. THE EFFECT OF CURRENT DENSITY ON THE COMPOSITION OF THE PLATE

Ag/Cd in bath = .35; Temperature = 27° C. No agitation.

Current Density amps/dm²	Percent Ag in Plate
.113	98.0
1.1	51.0
40.0	25.0
1000.0±	19.6

The alloy was plated on a copper wire about 2.0 mm in diameter to get 1,000 amps/dm² current density. Of course, this value is not very accurate as it is difficult to measure the surface of the cathode.

Some of these specimens were not good deposits from the electroplater's standpoint. The current densities below 1 amp/dm² give deposits which tend to crack off and which form a black amorphous looking powder on the surface. It is not to be mistaken for the typical burnt deposit. Current densities above 40 amps/dm² produce burnt deposits. It was found that deposition with extreme current densities does not bring any fundamental change in the structure of the adherent deposit. That is, the compounds or solid solutions to be expected from the analysis are present rather than merely a mixture of the two metals. The structure of a burnt deposit is an interesting exception.

Effect of Temperature on Structure of Deposit

An increase in temperature favors an increase in the percent of silver in the plate, other conditions remaining constant.[6] A silver-cadmium alloy was plated from a bath under the following conditions:

Ag/Cd in bath = 0.1
Current Density = 21.0 amps/dm²
Temperature = 85° C.
No agitation

A burnt deposit was formed, but the shiny adherent deposit beneath it has the same alloy structure as a thermal alloy of the same composition.

Results

This study of silver-cadmium alloys has brought out the following interesting results:

1. The two metals are never deposited separately to form an alloy mixture. They are always present in the alloy in the form of a solid solution or compounds.
2. The predominant phase in the electrodeposited alloy is the same as that in a thermal alloy of the same composition. The predominant compound or solid solution may therefore be predicted from the chemical analysis.
3. The deposit is usually heterogeneous containing small amounts of additional compounds or solid solution which cannot be predicted from the chemical composition.
4. The above conclusions hold for all adherent deposits regardless of the composition of the bath from which the alloy is plated or the current density or temperature at which it is plated.
5. The results for burnt deposits show an interesting variation from this and are discussed below.
6. It is not safe to say definitely that these relations hold for all electrodeposited alloys, although they probably are approximately true.

The Structure of Burnt Deposits

These nonadherent, powdery deposits are usually produced when either the current density or the temperature of deposition gets too high. It is interesting to find that even this powder is not a mixture of the metals but is made up of compounds or solid solutions. The compound, however, is one which contains a greater proportion of silver than does the powder as a whole. There is also present in these burnt deposits a large percentage of crystalline $Cd(OH)_2$. The precipitation of this $Cd(OH)_2$ near the cathode and its occlusion in the deposit leaves the bath near the cathode with a higher concentration of silver and accounts for the deposition of the silver rich alloy. It should be noted that the "black, amorphous-looking powder" to which reference has been made which was occasionally precipitated on plates using a current density of about .50 amp/dm² may also be considered as a burnt deposit. It is not amorphous. The powder is a mixture of a silver-cadmium alloy and $Cd(OH)_2$. It must be admitted that there is some difficulty in accounting for the precipitation of $Cd(OH)_2$ at such a low current density. This occlusion of $Cd(OH)_2$ offers a possible explanation of burnt electrodeposits. It would cause the deposit to be non-adherent and powdery, and hence not metallic in appearance. This is also a very striking illustration of the possibilities of the X-ray method of analysis in this field. It would be very difficult to establish the presence of $Cd(OH)_2$ by ordinary chemical means.

The Grain Size of Electrodeposited Metals and Alloys

The smooth, sharp diffraction lines pictured in Figure III are produced when the X-ray beam is reflected from crystals ranging in size from 10^{-3} to 10^{-5} cm. The crystals must be as small as this in order that there shall be enough crystals in the path of the X-rays to insure their presence in every conceivable orientation with respect to the beam—a completely haphazard arrangement. If the size of the grains is greater than 10^{-3} cm, those grains will cause the diffraction lines to appear somewhat broken and of uneven intensity. If the grains are smaller than 10^{-5} cm, there will be too few planes of atoms in each grain to reflect the X-rays perfectly and the lines will be broadened and diffuse.

In all the silver-cadmium deposits there is no evidence of the presence of grains less than 10^{-5} cm or greater than 10^{-3} cm. This holds for the burnt deposits formed at high current density and high temperature—and such

[6] Stout and Thummel: Trans. Electrochem. Soc. 59, 337 (1930). Fink and Gerapostolou: Metal Ind. (N. Y.) 28, 519, 562 (1930).

deposits of single metals frequently are characterized by larger grain size. It also holds for the so-called burnt deposit formed at .5 amp/dm^2 which had a distinctly amorphous appearance. The X-ray method is capable of indicating grain size approximately and under very carefully controlled conditions the grain size may be measured more or less quantitatively.

The Alloying of an Electrodeposited Metal or Alloy with the Base Metal

In none of the silver-cadmium alloys studied was there any evidence of the plate alloying with the copper on which it was deposited. This is according to previous experience. No instance has ever been found in which an electroplate alloyed with the metal on which it was plated. There is reason to believe that such alloying occurs to some extent after a long period of time due to slow diffusion. It is known that annealing will speed up this diffusion, and annealing for a few hours at a temperature not far below the melting point will cause the formation of alloys between the plated metal and the base metal. Such alloy development may be more conveniently followed by X-ray analysis than by any other method.

X-Ray Determination of Chemical Composition of Electro-Deposited Alloys

It has been shown above that the same relation holds between the crystal structure of the electrodeposited alloy and its chemical composition as exists between the crystal structure of a thermal alloy and its composition. A large number of annealed binary alloys have been studied by X-ray methods, so that in most cases the data are at hand when it is desired to determine the chemical composition of an alloy by finding its crystal structure.

A chemical analysis of a plated alloy is often difficult to make for several reasons.

1. It may be hard to strip the plate, and the very large excess of base metal may involve a lengthy separation.
2. The composition of the edge of a plate is different from that of the plate at a distance of one quarter inch or more from the edge.
3. If a plate is very thin the total amount of sample available for analysis is small.
4. The piece being analyzed is used up in the analysis.

The X-ray analysis eliminates all these difficulties.

1. The plate is not stripped but is analyzed in place.
2. The X-ray beam may be reflected from any part of the surface of the plate.
3. A plate too thin to be measured with a micrometer (.001" or slightly less) produces its characteristic diffraction pattern.
4. **A small finished object may be analyzed without in any way being injured.**

There is one obvious objection to the X-ray method of determining the composition. On page 48 it is shown that the ϵ-phase of the Ag-Cd system exists through the composition range 4-34 per cent silver. If it is present alone, the range is 17-31 per cent silver. In either event this does not approach a chemical analysis in accuracy. This objection is not as serious as it seems, however, since, as was mentioned above, it is the crystal structure of an alloy rather than its chemical composition which is of the greatest practical importance. To illustrate, there is a great difference in hardness between α-brass (which corresponds to the α-phase of the Ag-Cd alloys) and β-brass (analogous to β-Ag-Cd alloy), but there is little change in the hardness of β-brass as its chemical composition changes. It is more necessary then for control and testing purposes to identify the crystal structure present rather than to know the composition. The main reason for making a direct chemical analysis would be so that the crystal structure could be predicted.

Summary

1. The general principles involved in the application of X-ray analysis to the study of electrodeposited alloys have been pointed out.
2. An X-ray study of the structure of electrodeposited silver-cadmium alloys has demonstrated that this method can furnish the following useful information concerning an alloy plate:
   a. Crystal structure—which is of more practical value as a control test than is chemical composition.
   b. Grain size.
   c. Alloying between the plated metal and the base metal.
   d. Differences in stucture between shiny adherent deposits and burnt deposits.
3. The advantages of X-ray analysis over chemical analysis as a means of controlling and testing electroplated alloys have been enumerated.

Flemish Brass

Q.—How is a flemish brass finish applied to cast iron?

A.—The sand should be removed by pickling in a hydrofluoric acid pickel made of 1 pint of 48° hydrofluoric acid to each gallon of water. After pickling, neutralize the acid on the work by using a carbonate of soda solution. Then polish the work and plate in a nickel solution for 15 to 20 minutes; then brass plate in a good working brass solution from 45 to 60 minutes. Oxidize in a dip made of white arsenic 2 oz, sodium cyanide 8 oz, 26° ammonia ½ pint, water 1 gallon. Use hot.

When the work is oxidized to a dark color, relieve the high-lights with a rag wheel, using fine pumice and water. Finally dry and lacquer. OLIVER J. SIZELOVE.

Platinum

Q.—I am building a small analytical test set with rotating anodes for determination of the metallic content of solutions. I am of the opinion that these anodes should be of platinum.

Do you think these would work equally well made of brass or copper, having a thin coating of platinum electrodeposited on them?

A.—A deposit of platinum for your work should of necessity be quite heavy. We believe that it would be as cheap, and would certainly be a great deal better, to have the anodes made of platinum foil. The price of platinum today is so low that the cost will not be very great.

OLIVER J. SIZELOVE.

The Metal Manufacturing and Finishing Industries of the United States

By ADOLPH BREGMAN
Managing Editor

What It is; Who Buys Its Output; Who Provides It With Equipment and Supplies. A Survey of the Available Statistics of the American Industries Manufacturing Non-Ferrous Metal Products and Finishing All Metals; Also the Trades Which Consume These Products, and the Trades Furnishing Its Needs.—Part 2*

Use of Lead in the United States
[In Tons of 2,000 lbs. (a)]†

Purpose	1931
White lead (b)	77,500
Red lead and litharge (c)	18,000
Storage batteries (d)	157,000
Cable covering (d)	117,000
Building (e)	40,000
Automobiles (e)	6,000
Railway equipment (e)	1,000
Shipbuilding (e)	400
Ammunition (d)	29,700
Terne plate (d)	2,200
Foil (d)	20,000
Bearing metal (g)	12,000
Solder (f)	20,500
Typemetal (f)	14,400
Calking (f)	15,000
Castings (f)	7,000
Other uses (h)	30,000
Total	567,700

†American Bureau of Metal Statistics.

Footnotes: (a) Includes antimonial lead. (b) From data of sales reported by U. S. Bureau of Mines up to 1928. Later figures have been determined by an improved method. (c) Exclusive of oxides for storage batteries. (d) Based on reports from a large proportion of manufacturers in each industry. (e) Based on estimates of manufacture and the quantity of lead used per unit of manufacture. Under the head of building is included the lead used in chemical construction. (f) Estimates of persons engaged in the trades. (g) Based on the estimated consumption of lead for this purpose by the railways. (h) Conjectural.

Note—We estimate that about 75% of the lead that goes into storage batteries returns into production of soft and hard lead, which production is not accounted fully in previous tables owing to omission of some of the secondary smelters.

Silver Statistics

Silver Bought by Silversmiths and Its Disposal in Consumption††
(Troy Ounces—1,000 Fine)

Products:	1931
Flatware	5,909,233
Hollow-ware	2,266,444
Toiletware, jewelry and novelties	647,916
Total silver content of finished products	8,823,593
Estimated losses	60,696
Total silver consumption	8,884,289
Scrap sent to smelters and refiners	8,927,274
Total silver turnover	17,811,563
Purchases:	
Sterling silver (1925 fine)	14,656,321
Bar silver (999 fine)	3,083,237
Silver solders	70,193
Silver in other forms (principally scrap)	1,812
Total silver content of purchases	17,811,563

Silver Bought by the Electroplating Industry and Its Disposal in Consumption††
(Troy Ounces—1,000 Fine)

Products:	1931
Flatware	1,901,254
Hollow-ware	338,179
Toiletware, jewelry and novelties	68,298
Total silver content of finished products	2,307,731
Estimated losses	3,810
Total silver consumption	2,311,541
Scrap sent to smelters and refiners	575,902
Total silver turnover	2,887,443
Purchases:	
Metallic silver exclusive of solders (principally anodes)	2,716,448
Silver salts	139,059
Silver solders	31,936
Total silver content of purchases	2,887,443

*Part 1 was published in our January issue.
††Merrill, Charles White, Consumption of Silver in the Arts and Industries of the United States; Econ. Paper 14, Bureau of Mines, 1932, and Brass World, August, 1932.

Silver Bought by the Precious Metals Alloying, Rolling, Drawing, and Rolled-Plating Industry and Its Disposal in Consumption Exclusive of Products Sold to Silversmiths††

(Troy Ounces—1,000 Fine)

Products:	1931	Disposal:	
All products including silver solders	3,656,982	Jewelry, optical goods and novelties industries	2,073,615
Estimated losses	3,042	Industrials	1,224,820
		Others	358,547
Total silver consumption	3,660,024		
Scrap sent to smelters and refiners	129,515	Total silver content of sales	3,656,982
Total silver turnover (purchases)	3,789,539		

††See footnote to first silver statistics table, page 51.

Aluminum — From Ore to Fabrication

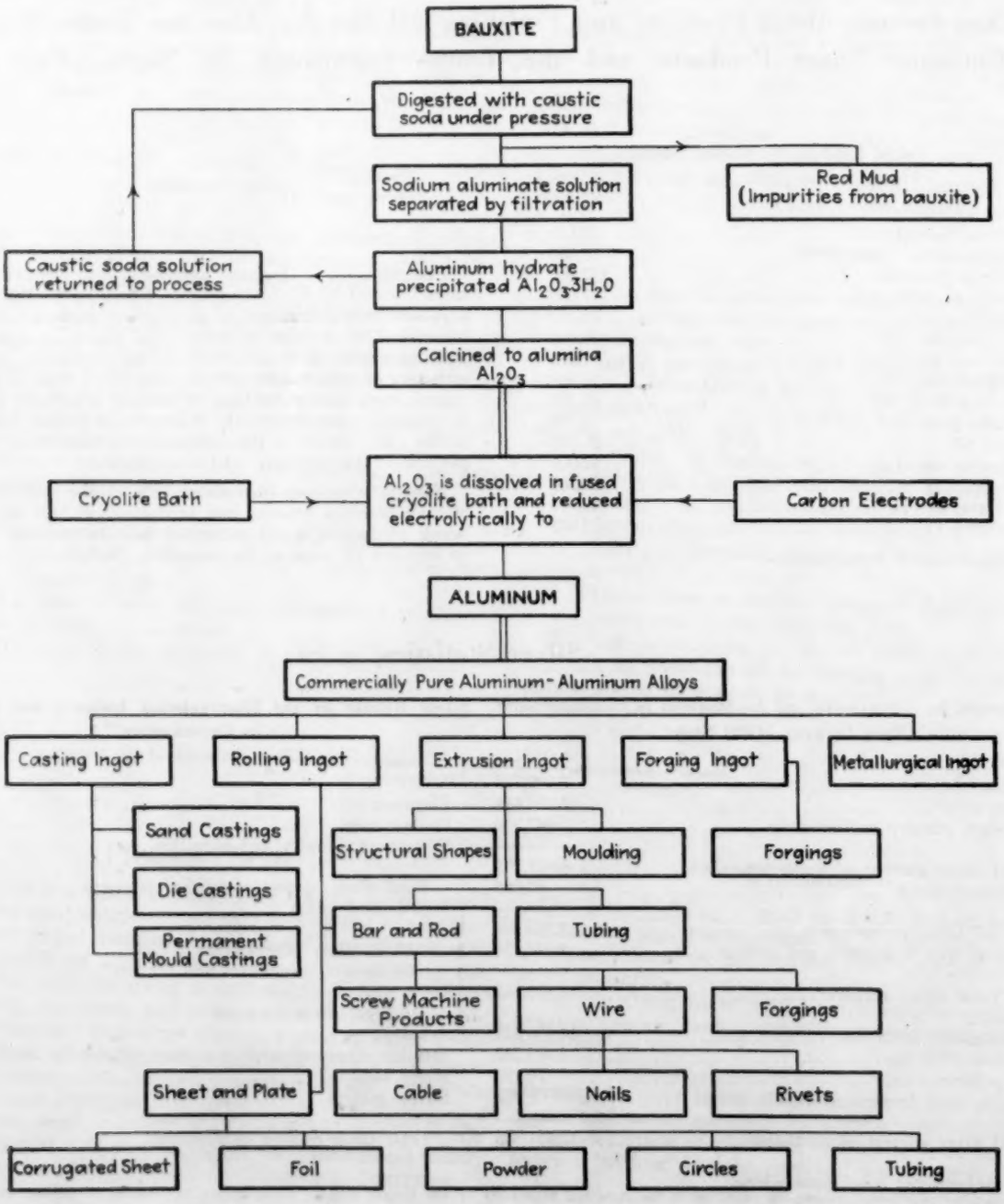


Illustration by courtesy of "Metal and Mineral Markets"

Silver Consumed in 1931 by Industries Making Products for Ultimate Consumption††

	Fine Ounces	Per Cent
Sterling silver industry	8,823,593	37.4
Photographic industry[1]	6,587,623	27.9
Electroplating industry[1]	2,307,731	9.8
Jewelry, optical goods and novelties industry[2]	2,073,615	8.8
Chemical industry[1] (exclusive of photographic and electroplating)	1,461,548	6.2
Industrials, including silver solder[2]	1,224,820	5.2
Dental supplies	649,984	2.8
Miscellaneous consumption[2]	358,547	1.5
Total silver content of products	23,487,461	99.6
Total losses (estimated)	91,494	0.4
Total silver consumption	23,578,955	100.0
Scrap sent to smelters and refiners	11,673,701	....
Total silver turnover	35,252,656	....

[1]The chemical industry made products containing 9,652,213 fine ounces in 1928, 11,151,286 ounces in 1929, 11,401,719 ounces in 1930, and 10,174,388 ounces in 1931. This silver entered ultimate consumption or was returned to smelters or refiners as scrap through the photographic, electroplating, and mirror industries, was partly consumed as chemicals in laboratories and in medicines, and was sold through jobbers to unclassified users.

††See footnote to first silver statistics table, page 51.

[2]Manufacturers that alloy, roll, draw, and rolled-plate precious metals made products containing 3,916,814 fine ounces of silver in 1928, 4,625,838 ounces in 1929, 3,732,744 ounces in 1930, and 3,656,982 ounces in 1931, exclusive of those sold to silversmiths. This silver entered ultimate consumption as jewelry, optical goods, novelties, industrial products, and in other forms.

This article will be continued in an early issue.—Ed.

Production of Electrolytic Copper Sheets

By A. EYLES

Mechanical Engineer, Manchester, England

AFTER thirty years of experiments and research Sherard Cowper-Coles of England has evolved a practical process which enables sheets of pure copper of varying degrees of hardness and of any thickness to be produced in one operation direct from copper ingot partially refined. The process is one of electrolytic refining and deposition on a revolving drum. Various attempts made in the past to produce sheets by an electrolytic process have not been commercially successful for a number of reasons, some of the most important being: slowness of deposition; inferiority of the sheet to ordinary rolled sheet; low efficiency of the process; large proportion of scrap metal; an even gage (uniformity) could not be obtained; considerable floor space was required.

These difficulties are claimed to be entirely overcome by the Cowper-Coles process, and sheets equal to or superior to rolled sheets are produced. The process is one of building up, not breaking down, and therefore very thin sheets can be made as cheaply as thick sheets, except for additional labor in handling a greater number of sheets per ton. The new process enables the thinnest sheets to be produced of almost any size, for instance, 12 ft. by 4 ft., and permits small units to be worked very economically.

Both in hot and cold rolling the amount of scrap is very considerable; varying with the gage; the thinner the gage the greater the amount of scrap. In the new process the amount of scrap is said to be reduced to about one per cent; but as it has been refined during the process of deposition it fetches the highest market price. It is claimed that the copper can be made very hard without after treatment, that it can be used for spring contacts in place of phosphor-bronze, whilst retaining the advantage of pure copper with its high electrical conductivity. The process can also be employed for the production of bimetallic sheets, such as copper sheet faced with tin of any desired thickness or nickel suitable for spinning or stamping. Copper sheets produced by the new process have on one side a high mirror finish, which in many industries is a great advantage.

Plated vs. Solid Metals

Q.—We are anxious to obtain information on the comparative rust resisting efficiency of mild steel, chromium plated, as compared with bronze or Everdur.

The product which we are getting ready to make is used in line construction and will be subjected to all the elements.

A.—Bronze and Everdur will not "rust" in the same manner as mild steel, regardless of how steel is protected by an electrodeposited coating. The former metals may tarnish and corrode, assuming a green color, but their life is almost indefinite. Statues are made of bronze. Steel will eventually, be entirely consumed by rust. However, properly protected by the right plate, correctly applied, it should last long enough for most commercial purposes.—E. E.

Green on Cadmium

Q.—We wish to plate a green finish on a cadmium plated casting. This green will be then mostly removed by scratchbrush, and the castings lacquered. In other words, we want to get a two-tone finish, using cadmium plate and green. Can you advise us the best way to get this result?

A.—We know of no way to plate a green tone on cadmium plated work. The only suggestion that we have to offer is to use a pigment color.

Chromic green ground in japan of the desired color is diluted with turpentine and painted on the work. When dry, it is relieved with a rag moistened with turpentine.

If this method is used, it will be necessary to brush the work for a finish before applying the pigment.

OLIVER J. SIZELOVE.

Zinc in 1932

By JULIAN D. CONOVER
Secretary, American Zinc Institute, Inc.

IN common with other metals, zinc in 1932 passed through another particularly trying year. Consumption was fully 60 per cent less than in 1929, or practically at the same rate as in 1921. Nevertheless the metal maintained a strong statistical outlook and in the opinion of market observers is in an excellent position to respond to any improvement in general business.

The decline in zinc consumption was a reflection of the extremely low rate of activity in other basic industries —especially in iron and steel, which, in the form of galvanizing, absorbs nearly half of the total zinc output,

JULIAN D. CONOVER

and also in brass, which consumes another fourth of the total. Other markets likewise suffered their share of the depression. On the other hand, technical and commercial research was vigorously continued, to enable zinc to take full advantage of new opportunities whenever business should revive.

The year 1932 witnessed the lowest zinc prices ever recorded, an extreme low point of 2.30 cents a pound at East St. Louis being reached last May. Subsequently the price recovered to 3.50 cents, and closed the year at 3.125 cents, a quotation identical to that at the close of the previous year. The average for 1932, 2.88 cents, was the lowest yearly average on record.

The extremely unremunerative prices, together with restricted outlets for the product, naturally caused drastic curtailment of production at both zinc mines and smelters. Production of primary zinc from retort smelters declined to 184,000 tons, as compared with 367,000 tons in 1929, and electrolytic production was but 23,000 tons compared with 156,000 tons in 1929.

Production of secondary zinc showed a similar decline, amounting to only 15,000 tons or less than a third of the 1929 output. The ratio of secondary to primary metal is considerably lower in the case of zinc than in the case of either copper or lead; in fact, secondary metal constitutes less than 10 per cent of the total zinc production. Being derived chiefly from galvanizers' drosses, skimmings, etc., the output of secondary zinc naturally rises and falls with the activity of the steel industry.

Research and allied activities to improve the market position of zinc have been steadily carried forward. In the protective coating field, no real substitute for zinc is known, capable of giving protection against the rusting of iron and steel equivalent to that of a heavy galvanized coating. Educational work is being conducted by the American Zinc Institute to develop increased appreciation of the value of zinc coatings, and to build up the sale of galvanized sheets through provision of a standard heavy-coated sheet for building use, which will give far greater service and economy than the usual lighter-coated commercial material. Active support is being given this movement by manufacturers of galvanized sheets; and 13 companies, representing 75 per cent of the industry, have taken licenses to use the "Seal of Quality" stamp on this heavy-coated product.

A new development, which is reported to have reached the commercial stage, is the application of extraordinarily heavy zinc coatings on steel wire through new methods of electro-deposition recently developed in electrolytic zinc plants.

The use of zinc in brass is firmly established and widespread. Further developments are in prospect through perfection of the process for producing brass die castings, which will reduce the costs of many articles and extend the use of this valuable alloy.

In the rolled zinc field, a most interesting development of the last two years has been a substantial increase in the sale of fruit jar caps—a result of reduced incomes, low sugar prices and plentiful fruit crops, combining to produce a large increase in home canning operations. Some of the dry battery business has undoubtedly been permanently lost through the general use of light-socket power for radio sets; but on the other hand, there is still an important market for battery-operated sets in rural districts, as well as a large and steady demand for flash light batteries. The development of plating technique, producing nickel and chromium finishes on rolled zinc, has made possible an increased application in automobile parts and accessories of many sorts. Electric cable wrappings have also become an important outlet for rolled zinc.

A fascinating development has been the recent growth in the use of zinc-base die castings. With their low cost, their high speed of manufacture in finished shape (requiring little or no subsequent machining), their ability to take artistic finishes of all types, and their adaptability to a tremendous range of useful and ornamental purposes, zinc die castings are constantly entering new fields —not only in the automobile industry, but in products as varied as machine gears, clock cases, golf club heads and full size typewriter frames. Die casting has been spoken of as the ideal way of making complicated metal parts, and with improvements both in the zinc alloys used and the technique of casting, a steadily increasing use of zinc for this purpose seems plainly indicated.

All in all, zinc producers have had their full share of difficulties in the past few years, and with the potential capacity for overproduction that exists, have still many problems ahead; yet in view of the diversified and large-scale use of zinc in articles of everyday utility, which can be aggressively developed by the industry, and the general strength of its statistical position, the future of zinc may be viewed with confidence.

The Buying and Selling of Old Gold

By C. M. HOKE
Consulting Chemist, The Jewelers Technical Advice Company, New York

An Enquiry into the Profits Available in the Handling of Old Precious Metals

"CAN I make money buying and selling old gold?" "Where can I buy it?" "To whom can I sell it?" "How much is this old silver worth? This platinum? This palladium?"

These and a dozen related questions have come up frequently of late, since the depression has led hundreds into buying and selling old precious metals.

When other commodities go down in price, gold becomes relatively more valuable, since its price is fixed by law. That is one reason why trade in the metal has been so active; in addition many people are now anxious to exchange old trinkets, even old dentures, for a little cash. As a result men are going from house to house, buying up old precious metals. What sort of business is this, and does it pay?

The answer is, that if a man can combine initiative with the ability to bargain, plus the patience to learn a little about the precious metals, he may make a good living.

The Evolution of a Metal Dealer

Usually the course of development—the evolution, so to speak—of a precious metal dealer, follows three or four stages. First he is an agent, buying precious metals and turning them over, as they are, either to the United States Assay Office or to some established refiner. There are hundreds of such agents at work now; no office is needed, very little capital, and the tools of the trade may be simply a hand balance, a few Troy weights, a testing stone, standard gold and platinum "needles," and two or three little bottles of acid—the whole equipment small enough to pack into one's overcoat pockets.

In the second stage of evolution he will acquire a few evaporating dishes and funnels, some chemicals, etc., and possibly a blowpipe or furnace for melting the metals. He will refine the material bought, separating it into the fine gold, the pure platinum, pure palladium if any, and so on. From jewelers or dental mechanics he will buy the scrap and filings that are by-products of their work. This waste, which is almost as valuable per ounce as old jewelry, is a mixture of bits of gold, platinum, and other metals, plus more or less dirt. The refining of this material can be carried out in a small shop or even in a garret or basement, with rather inexpensive equipment. The pure metals that are recovered may be returned to the jeweler or dental mechanic, or sold to the Assay Office or to some bullion dealer.

As our hero progresses, he learns that there is a demand for precious metal alloys. The jeweler from whom he buys mixed filings will need some 14-k green gold, or some 10-k yellow gold. The dental mechanic may desire some of those gold-platinum-palladium alloys so useful in making partial plates or removable dentures. Accordingly our refiner takes the pure metals he has recovered, and makes them up into the alloyed metals used in industry. But before considering the fourth or final stage in the development of a precious metal dealer, let us inquire further into the disposal of old precious metals.

Disposing of Old Gold

Suppose we have a collection of old gold articles—no platinum, no palladium. Can we sell it to Uncle Sam? If we comply with his regulations, we can—and no questions asked. His regulations vary from time to time, so one should ask occasionally for a sheet of the current rulings. Here are some of the more important rules now in effect. (November, 1932).

(1) The material must be worth at least $100. Fine gold is worth $20.67 an ounce, never more, never less—at least as long as this country stays on the Gold Standard. Indeed, that is just what the Gold Standard means. Accordingly if our material contains as much as a scant five ounces (Troy) of fine gold, we can sell it to Uncle Sam. Or if we have ten ounces of stuff that is half gold and half base metal, he will accept it. Native gold—nuggets or clean gold dust—is usually of such a character that six or eight ounces make an acceptable lot.

(2) The material must not contain 800 thousandths or more of base metals. In other words, it must be at least 200/1000, or 20%, fine gold. 5-k gold is 208/1000 fine; so do not try to sell stuff much less than 5-k fine.

Some other rulings must be remembered too. Particularly the fact that Uncle Sam does not want platinum or any of the platinum-group metals, such as palladium and iridium, even though they are right now more valuable than fine gold. If you hand him material containing these metals, he will not pay you a cent for them. In fact when he makes his refining charge, it will be just that much higher, because of the labor of making an assay when the platinum metals are present.

Yes, Uncle Sam makes a charge. He makes a charge for the refining of the material, his rates varying slightly from time to time. Also he makes a charge for melting your metal into a bar, which he does every time. It is a waste of time to melt it into a bar yourself; hand it to him as it is. Since the United States is not in this business for profit, these charges are relatively small.

The shipment of metal may be carried by hand, or shipped by express, to the nearest Mint or Assay Office. The Government does not have any traveling agents. Within the last few months many people have been defrauded by bogus "agents" pretending to represent the Treasury Department, and buying metal at a fraction of its worth.

Mr. Robert J. Grant, Director of the Mint at Washington, has publicly stressed the point that while the Mint is always ready to purchase gold, it has no agents solicit-

ing for it. It is anxious to stop the practice of false representation, especially when it is costing the owners of old jewelry a considerable loss.

At certain times in our history, the Government has bought silver as well as gold; that is, native silver, old sterling silver, and old bullion in which silver was the principal metal. At this time the Mint does not need silver, and so is not buying it. Maybe it will later, in which event Congress will pass a law authorizing it to do so.

These last remarks do not apply to the silver that is present as an alloy in most gold jewelry. Uncle Sam pays for that at the market price, less his refining charge. But he is not buying metal the principal element of which is silver.

What to Do With Silver

At present the price of silver is about 28c a Troy ounce. It fluctuates from day to day, and political and financial conditions throughout the world influence it. You will find price quotations in the daily newspapers. Some of our Western States such as Colorado and Utah, who produce silver, wish that the price were fixed and standardized in the same sense as the price of gold. That would stabilize the silver mining industry.

Meanwhile, though silver is not high, there is a good market for it, and if one has a quantity of old sterling silver he can sell it to a professional refiner, especially one who is equipped to make it into sheet, wire, or the like, and to sell it for making up new goods. Several refiners specialize in silver.

Silver plated ware is of such small value to-day that in general it is not traded in except by those who happen to have many pounds of it—the manufacturers of silver-plated goods, for instance, whose work produces much clean silver-plated scrap. Usually this is sold to a copper refinery, where it goes through the same electrolytic process that is used in refining copper; the silver is recovered as a by-product.

How Much Is Paid for Old Gold?

As we said before, fine gold sells at $20.67 a Troy ounce, or about $1.03 a pennyweight. The buyer pays slightly less than that. Oridinary gold, containing more or less base metal, is worth correspondingly less. Here is an easy rule for figuring the approximate worth of clean gold scrap: Find its karat; find its weight in pennyweights; now multiply the karat times the weight times four cents.

For example: An old ring mounting, when tested,* prove to be 14-k; it weighs 3 dwt. Multiply 14 x 3 x 4c. The answer is $1.68.

One of our large refiners, a purchaser of much old gold scrap, gives the following statement of approximate prices paid:

8 karat gold, 32c per pennyweight.
10 karat gold, 40c per pennyweight.
12 karat gold, 48c per pennyweight.
14 karat gold, 56c per pennyweight.
18 karat gold, 72c per pennyweight.
20 karat gold, 80c per pennyweight.
22 karat gold, 88c per pennyweight.

This table will suggest the margin of profit on which this business has survived.

Gold filled stock, so commonly used in making watch cases, is less valuable; it may bring 20c an ounce or a little more. Note that this price is for an ounce—not a pennyweight. (An ounce contains 20 pennyweight.)

*A booklet on "Testing Precious Metals with the Touchstone" can be obtained from C. M. Hoke, 22 Albany Street, New York City. Price 50c.

Gold plated goods is worth even less; possibly 10c or 15c an ounce. Uncle Sam does not buy it, and most refiners receive it without enthusiasm, as the task of refining it is relatively expensive.

Platinum and the Platinum Metals

Like silver, these metals have fluctuating prices. At present they are much less costly than they were in War times. Since they cannot be sold to the Government, the best way to dispose of them is to someone who has good use for them—a bullion dealer who is actively selling platinum, or articles made of platinum, or a jeweler who wants clean platinum for the manufacture of his wares. Sometimes it pays to shop around and find the best bidder.

High grade platinum jewelry is usually made of straight iridio-platinum. Sometimes parts of the article will be made of gold, the tops only being platinum. This means that the buyer should be able to recognize this situation, and also to separate the metals by chemical means, recovering each metal in pure form.

In a jewelry factory in which both gold and platinum jewelry are being made, the filings and scrap will always contain both metals, even though the workmen try hard to keep them separate. Therefore the dealer who handles this material should equip himself to refine and separate it. The process is a chemical one, by no means beyond the abilities of the average layman, and the equipment required is neither expensive nor bulky.

Metals Used in Dentistry

Many of the yellow gold fillings are almost fine gold—22-k or so. The modern cast fillings are sometimes of lower karat. Dentists often place fillings of much less expensive materials in the back teeth, where they will not show; some of these turn dark or even black. From the standpoint of the patient's benefit these fillings are often of the highest value, but to the old-gold buyer they are not attractive. He wants gold or platinum, instead.

Old fashioned false teeth were, in many cases, provided with two small pins of high-grade iridio-platinum. Much of the work done today, while more satisfactory to the patient, may contain no precious metal at all, so each job must be considered individually. Many of the partial dentures of today are made of gold-platinum-palladium alloys, some of which are worth distinctly more than fine gold. They often look like so much nickel, being white or of a slightly yellowish white color. A test, involving a touchstone at least, or exposure to an oxy-gas flame, should always be made. The filings and scrap brushed from the work-table of the dental mechanic have many of the characteristics of the waste generated by the manufacturing jeweler, and usually are treated in the same general manner.

Low Grade Wastes

So far we have talked only of scraps or wastes of relatively high value. But low-grade wastes constitute a big factor in the precious metal world, and probably are the cause of most of such disagreements as have arisen between buyer and seller.

By low-grade wastes we mean material containing a large proportion of dirt, such as the sweepings from the jeweler's floor. Jewelers also arrange to let the water used in washing the workmen's hands settle in tanks before passing to the sewer. They collect the deposit of soap, dirt, and small amounts of precious metals, which is dried and sold. Sometimes it is worth about five dollars a pound. Also the dust formed by the polishing

machines is collected and burned. All these constitute low-grade wastes.

As we said before, the refining of high-grade wastes is easily carried out in a small shop, with modest equipment. For that reason we have hundreds of shops in this country doing this work at a profit. But low-grade wastes require large furnaces, etc., and their actual refining should be carried out only in large quantities.

For these reasons, the average small refiner usually performs only the first steps in the refining of this stuff; he burns it, grinds and sieves it, and takes out the larger bits of metal. The remaining fine powder he sells to a plant that is equipped to carry out the last stages of the recovery. There are only a handful of these plants in the whole country, and some of these handle this material in ton lots.

The Final Evolution of the Metal Dealer

As this preceding paragraph suggests, the highest stage in the development of the dealer in precious metals, is that in which low grade as well as high grade materials are refined and separated. The pure metals that are recovered may then be sold as simple bullion, or they may be made up into the alloys required in industry, and possibly formed into bars, sheet, or wire, ready to go again to the workbench of the jeweler or dentist.

Bronze Grave Markers

Q.—We expect to make bronze grave markers and would appreciate any information you can give on

1. Analysis of metal
2. Molding sand
3. Finish.

A.—For grave markers we suggest the following mixture:

90% copper
6½ tin
1½ lead
2 zinc.

For molding sand, we suggest facing the mold with French sand and No. O Albany—50% of each. Run this mixture through a muller or grinder. Temper with molasses water and skin-dry.

For finish, clean and give as high a polish as possible with wire wheel brush, and then flatten the face of the letters, and the border. Brighten with sandpaper disc. Then finish-dip in a solution of barium sulphide. Spray with a clear lacquer. The sulphide solutions could be ½ ounce to a gallon of water.

The melting of the metal is very important. No metal should stick out over the crucible, and only an experienced melter should be employed on this class of work.

W. J. REARDON.

Rolling Copper Wire Rod

Q.—In perusing the July issue of METAL INDUSTRY, page 284, we note some remarks in answer to a query as to the best rolling equipment to instal for the production of copper wire rod.

As we are now considering the installation of a new wire rod rolling mill plant and as our conditions in regard to relatively small output in conjunction with the necessity of very low conversion cost are somewhat similar to those mentioned by you in your reply, it would be of considerable interest to us to have your views on one or two aspects of the design of a mill to fulfil such conditions to which, in our opinion, it is necessary to give much study if the above desiderata are to be achieved.

In the first place we should like to ask you what, in your opinion, is the minimum finishing speed, i.e. delivery speed from the finishing stand which will enable a well mechanized rod mill of simple type to finish 250 lb. coils of ¼" dia. rod in, say, 14 to 16 passes with a satisfactory end to end variation in gauge.

Our other query concerns the best design of a repeating equipment to provide on the side on which the rod emerges as an oval. An indication of your experience on this point would be much appreciated.

A. In regard to your first question, a well mechanized rod mill will finish 250 lbs. coils of ¼" in diameter rods at a **maximum** speed of about 1,500 ft. per minute and after 16 passes.

1. The designer and manufacturer of these mills have worked to establish maximum speeds of delivery, and there are no established records of minimum speeds, under the condition you state, that would be reliable.—W. J. PETTIS.

Hot Tinning Bronze

Q.—We are very desirous of obtaining information concerning the exact procedure for hot dipped tinning bronze water meter parts.

Will you please advise us the type and strength of acid to use, the type of pot, and any other information that would be pertinent to this question.

A.—When a tin pot is installed it is the usual practice to make provision for tinning more than just one kind of material. Bronze parts can be first dipped in a flux of zinc chloride, and then put in the tin bath. If they have any oil or grease on them they must first be put through a good commercial cleaning solution.

For general purposes the setup should consist of a small wooden pickle tank, a wash tank, a small tank for hydrofluoric acid, a flux tank, and a water quench tank. The pickle and wash tanks can be 30" x 24" x 24". The hydrofluoric tank for small work, a lead-lined box of 2" timber 24" x 12" x 12". The tin pot can be most any convenient size depending upon the character of the work. If the work is all small, a pot 30" x 24" x 24" deep will serve; if longer pieces are to be coated, a pot 6' x 24" x 24" can be used. The flux tank then should be 4' x 24" x 24" and the water quench tank 30" x 24" x 24". The tin pot is usually cast iron, and may be procured from any good pot maker. The pickle tanks can be made of cypress or long-leafed yellow pine.

In tin coating small bronze articles it may not be necessary to pickle them. They are wiped clean and then dipped into the flux of zinc chloride, and then put in the tin bath. They are then taken out to see that they are fully coated, then redipped, drawn out, shaken well, and then wiped clean with waste. Any threaded parts are brushed clean with a small brush. About half an ounce of aluminum is added to the bath about once a week, and the temperature is kept at about 825° F.—W. I.

The Protective Value of Electroplated Metal Coatings on Steel

A Progress Report by the Joint Inspection Committee of the American Electroplaters' Society, American Society for Testing Materials, and Bureau of Standards*

FROM THE QUARTERLY REVIEW OF THE AMERICAN ELECTROPLATERS' SOCIETY, JANUARY, 1933.

I. Introduction

THE purpose of this report is to summarize the results of the exposure tests of electroplated coatings on steel up to October 1, 1932, and the progress made in the study of accelerated tests. This discussion is confined to samples with nickel or chromium finishes. There have not been sufficient failures of zinc or cadmium coatings to warrant any conclusions, and no laboratory tests have yet been made on these coatings.

As the following conclusions for nickel and chromium coatings are based on from six to eight month's exposure, during which time extensive failures occurred in only three locations, **they must be considered as tentative** and subject to revision in the light of future observations. Some of the results are so striking, however, that it is believed by the Committee that they warrant publication at this time. The Committee will be glad to receive comments and especially and definite evidence that appears to contradict or modify these conclusions.

II. Conditions Used in the Exposure Tests and Inspections

The details of the preparation of the specimens have been published in a mimeographed report, and in the May, 1932 Monthly Review of the American Electro-Platers Society. Five specimens of each set were exposed as follows: Washington, D. C. and Key West, Florida in February, 1932, and New York, N. Y., Sandy Hook, N. J., Pittsburgh, Pa., and State College, Pa., in April, 1932. They have been inspected at intervals of about one month by members of the Committee, assisted in many cases by other interested persons. In all 44 inspections have been made, with a total of 142 persons participating, or an average of over 3 per inspection. The Committee desires to thank all those who have aided in these inspections. All persons desiring to take part in an inspection are welcome. Dates will be furnished on request addressed to the Chairman of the Committee.

At each inspection, each person gave a numerical rating to each specimen, based upon the presence and extent of rust, in accordance with the following scale:

RATING NO.	APPROXIMATE PER CENT OF AREA RUSTED
5—Perfect, no rust	0
4—Very slight rust	0– 5
3—Slight rust	5– 10
2—Decided rust	10– 20
1—Very evident rust	20– 50
0—Badly rusted	50–100

Rust within ¼ inch of the edges of nickel or chromium samples was disregarded, as the edges may have been buffed through. Rust stains extending more than ¼ inch from its apparent origin were also disregarded. Defects other than rust, such as white or dark stains, blisters, etc., were noted, but did not enter into the numerical ratings.

The behavior of the five specimens in each set was remarkably uniform. In general the ratings of different inspectors were in good agreement, but in a few cases the results were less concordant. Such difficulties arose chiefly on samples that were very dark, and on which rust may or may not have been present. Subsequent inspections sometimes clarified these discrepancies. In all cases the mean of all observations was recorded and used in the computations.

After each inspection, the mean rating (R) for a set was recorded, and the average of this and the preceding mean value was multiplied by the number of weeks between inspections, to give the score (S) for that period. If for example at one inspection (R) was 3.0 and 4 weeks previously (R) was 3.5, the average rating was 3.25 and the score was $4 \times 3.25 = 13$. If the previous score was 47, the total score (T) was $47 + 13 = 60$. If the total period was 16 weeks, the total score of perfect samples would have been $16 \times 5 = 80$. The score of 60 for this set therefore represents $60/80 = 75\%$ (T%) of a perfect score. The following tentative conclusions are based on the percentage scores up to October 31, 1932. Differences of less than 10% in these results are probably not significant.

The rate of failure depended upon the character of the coating and upon the location. In general, most rapid failure occurred in Key West, Sandy Hook and Pittsburgh, and least rapid in Washington and State College, with New York intermediate. This is shown in Fig. 1 for Set 52, with one-quarter thousandth (0.00025) inch of nickel. In this and corresponding figures, each small rectangle represents the average rating for an inspection period, multiplied by the length of that period. The total area of each figure therefore represents the total score. The ratio of this area to that of a corresponding rectangle with a height of "5", represents the percent score for the period.

The relative rates of corrosion of different sets in a severe location (Key West) are shown in Fig. 2. Those

*This committee consists of: W. Blum, Chairman, Bureau of Standards, Washington, D. C.; Walter Fraine, National Cash Register Company, Dayton, Ohio; Jacob Hay, 18211 Rosecliffe Road, Cleveland, Ohio; R. F. Passano, The American Rolling Mill Company, Middletown, Ohio; W. M. Phillips, General Motors Corporation, Detroit, Mich.; L. H. Rovere, Western Union Telegraph Company, New York City; O. J. Sizelove, 919 Chancellor avenue, Irvington, N. J.

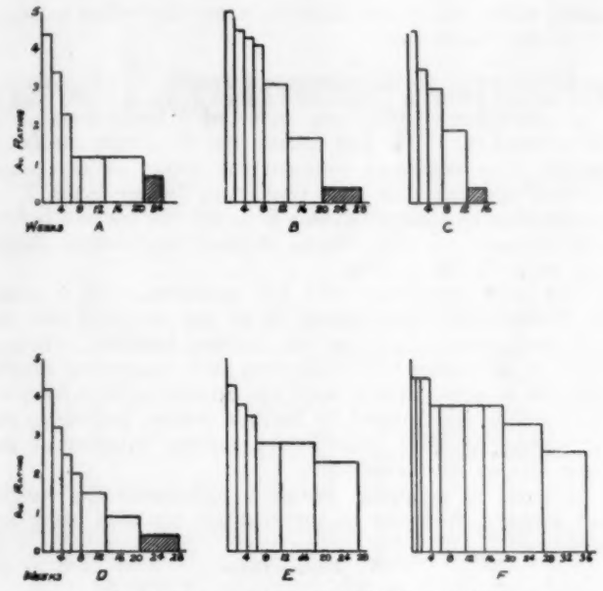


Fig. 1—Scores of Set 52 (0.00025 inch Ni)

	LOCATION	TOTAL SCORE
A	Key West	25
B	New York	46
C	Pittsburgh	24
D	Sandy Hook	28
E	State College	57
F	Washington	69

figures with a shaded strip on the right represents sets that have failed completely while the other tests are still in progress.

III. Tentative Conclusions

The following conclusions are based on the average of the percentage scores in Key West, Pittsburgh, and Sandy Hook, where the corrosion was severe. In the other locations, the very thin coatings have failed but most of the samples are still so nearly perfect that it is not possible to draw valid conclusions at the present time.

1. Thickness. The most striking effect is that of the thickness, as shown in Fig. 3. With either pure nickel (Curve A) or with layers of nickel, copper, nickel (Curve B) very little protection was obtained when the total thickness was less than one-half thousandth (0.0005) inch, and good protection was not obtained unless at least one thousandth (0.001) inch was present.

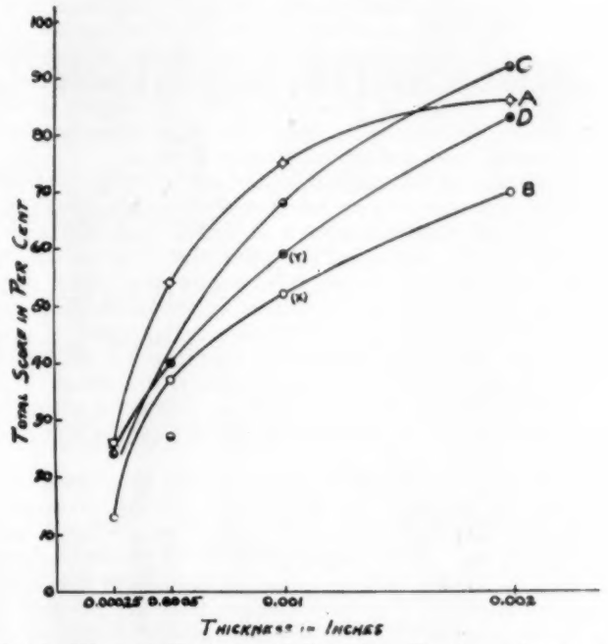


Fig. 3—Effect of Thickness of Deposits. Based on Average of Scores in Key West Pittsburgh, and Sandy Hook.

A—Nickel
B—Nickel, Copper (acid), Nickel
C—Nickel, Chromium (0.00002 in.)
D—Nickel, Copper, Nickel, Chromium (0.00002 in.)
X—Average of 9 sets containing copper and nickel
Y—Average of 9 sets containing copper, nickel and chromium

2. Effect of Copper. The fact that Curve B (Fig. 3) is at all points below Curve A, shows that a coating containing layers of both copper and nickel has less protective value than a pure nickel coating with the same total thickness. In these experiments a coating containing copper and nickel had about the same protective value as a pure nickel coating with a thickness equal to that of the

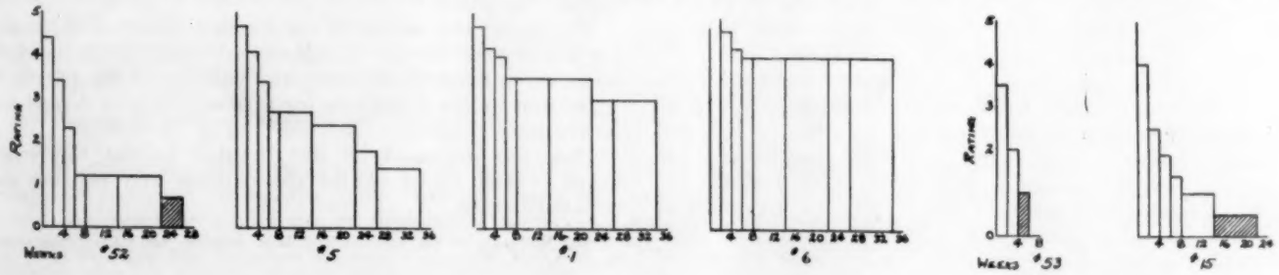
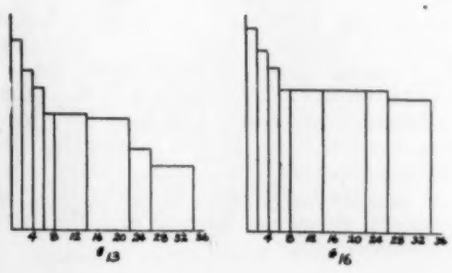


Fig. 2—Scores in Key West.

NO.	COATING	TOTAL THICKNESS IN.	TOTAL SCORE %
52	Ni	0.00025	25
5	Ni	.0005	49
1	Ni	.001	69
6	Ni	.002	81
53	Ni,Cu(A),Ni	0.00025	8
15	Ni,Cu(A),Ni	.0005	17
13	Ni,Cu(A),Ni	.001	49
16	Ni,Cu(A),Ni	.002	68



nickel present in the composite coating. This applies not only to deposits consisting of nickel, acid copper and nickel but to all coatings containing copper, whether deposited from acid or cyanide baths. The point X represents the average of nine such sets. If copper is employed, its use should be based on some manufacturing convenience, and not on its protective value.

3. Effect of Chromium. Curve C of Fig. 3 shows that the presence of two hundred-thousandths (0.00002) inch of chromium (deposited at 113°F and 150 amp./sq./ft.) slightly decreased the protective value of all deposits consisting of nickel only, except very thick ones. On the other hand, the chromium increased the value of the coatings containing both nickel and copper (Curve D). The chromium apparently counteracted the above effect of the copper. It appears that if chromium is to be applied, almost as good results are obtained when the undercoat consists of copper plus nickel as when it is pure nickel.

Other observations showed that a very thin chromium deposit, for example one hundred-thousandth (0.00001) inch, decreased the protection furnished by the nickel and copper layers, while deposits of three hundred-thousandths (0.00003) inch or more of chromium furnished added protection. Further exposure tests are planned to determine whether in general a thickness of 0.00003 inch of chromium is superior to 0.00002 inch. Further observations are also required to determine whether the conditions of chromium deposition exert definite effects.

4. Other Effects. The observations to date show that the conditions under which the copper or nickel was deposited had no marked effects on the protective value. It was found that although a layer of zinc or cadmium before the nickel sometimes increased the resistance to corrosion of the steel, such metals have a tendency to cause white stains and blisters, especially when exposed to severe conditions.

IV. Accelerated Tests

A preliminary study was made of a large number of accelerated tests. It was found that to obtain consistent results it is necessary to have the nickel or chromium surface so clean that it is free from "water break." A simple way to accomplish this is to rub the surface lightly with a paste of pure, finely divided magnesium oxide, and rinse it thoroughly.

The most promising tests for specimens with a nickel or chromium surface appear to be the ferroxyl and the salt spray tests. It is not yet known, however, whether these or any other tests will yield in a short time results that are closely parallel with the atmospheric exposures. This will be determined by further studies, including the application of these tests to the reserve samples of the same sets as were exposed.

Methods of stripping metals to determine the weight and average thickness of the coatings are also being investigated.

V. Future Plans

It will require about a year to complete the laboratory tests of nickel and chromium finishes. It is expected that by that time the exposure tests (including certain supplemental exposures) will warrant practically final conclusions on such coatings. The zinc and cadmium coatings will then be studied, and their exposure tests compiled.

As soon as conditions permit, a similar study will be made of plated coatings on other base metals, such as brass, aluminum, zinc and die castings. To complete this entire program it is desirable that these researches be continued for at least three years from date.

Supreme Court Denies Writ Against United Chromium

U. S. Patent No. 1,581,188 referred to in the attached announcement is a patent covering the process of chromium plating as generally used commercially today. It was issued to Dr. Colin G. Fink, professor of electrochemistry at Columbia University and is now held by United Chromium, Incorporated, New York City.

Since chromium plating is now widely used in scores of industries, ranging from jewelry manufacturing to oil refining, the litigation described has been keenly followed during the past four years by manufacturers and job platers. In this litigation, just brought to a close, Dr. Fink claimed, in substance, that it was his invention as covered by U. S. Patent No. 1,581,188 which had made possible a practical and commercially available process of chromium plating. This claim the court sustained.

United Chromium, Incorporated, holder of Fink Patent No. 1,581,188, licenses platers to use the chromium plating process covered by this patent. It provides an engineering service for the benefit of its licensees and maintains a force of field engineers and a research laboratory.

The Supreme Court of the United States on January 23rd, 1933, denied a Petition for a Writ of Certiorari filed by the International Silver Company, defendants in a suit brought against it by United Chromium, Incorporated, for infringement of the U. S. Patent No. 1,581,188, granted on April 20, 1926, to Colin G. Fink, covering processes of chromium plating and the preparation of baths therefor.

The suit was heard in the Federal Court for the District of Connecticut in June, 1930, before Judge Edwin S. Thomas. In October, 1931, a decision was rendered sustaining the patent.*

An appeal was taken to the Circuit Court of Appeals for the Second Circuit, which on July 29th, 1932, handed down an opinion re-affirming the validity of the patent.* A petition by the appellants for a rehearing was denied in November, 1932.

This was followed by the Petition to the Supreme Court, which Court denied the petition and refused to review the case.

* For full texts of the Decision and later Opinion, see METAL INDUSTRY for November, 1931, pages 465-8 and September, 1932, pages 355-8.

Gold Stripping

Q.—Please give formula for a gold stripping solution.

A.—The following formula for a strip to be used on either fine or karat gold will give good results:

Sodium cyanide	8 ozs.
Copper cyanide	2 ozs.
Yellow Prussiate potash	2 ozs.
Rochelle salts	2 ozs.
Water	1 gal.

Operate solution at 150°F., using 6 to 8 volts. Use lead or copper cathodes. OLIVER J. SIZELOVE.

Some Economic Aspects of Welding Aluminum

By D. E. ROBERTS

The Linde Air Products Company, New York

A Comparison of the Merits of Oxy-Acetylene and Oxy-Hydrogen Welding

A PAPER READ BEFORE THE 33RD ANNUAL MEETING OF THE INTERNATIONAL ACETYLENE ASSOCIATION, PHILADELPHIA, PA., NOVEMBER 16, 17, 18, 1932

BUSINESS conditions over the past few years have acutely focused the attention of production managers on every phase of the cost of industrial processes. The necessity for lowering production costs has been imperative, and often times vital to economic survival. It is therefore timely to discuss an application of welding which is broadly practised, and bids fair to enjoy continuous and material growth because of the many desirable inherent features of the metal—aluminum.

Aluminum Welding Increasing

Perhaps the most valuable property of aluminum is its combined lightness and strength, with ample ductility. It has excellent resistance to corrosion and therefore finds extensive use in the chemical and allied industries. Not the least of its valuable characteristics is its easy weldability, which is an essential element today in the extensive application of any metal or alloy in industry. Because aluminum, and in speaking of the metal I refer also to its common alloys, is so richly endowed with properties that commend it for industrial use in a great many fields, we envisage a much larger use of welded aluminum products than this market has heretofore enjoyed. We are of the opinion that a more general use of welded aluminum products awaits unanimity of thought with respect to the method of blowpipe welding among the producers of aluminum and those industries which are chiefly interested in its welded fabrication.

Two Methods—Oxy-Acetylene and Oxy-Hydrogen

Two methods are in common use. The Oxy-acetylene process is conceded to be the only practical blowpipe method for welding aluminum in thicknesses above ⅛ inch. It has long been contended, however, that the oxy-hydrogen process should be employed on gauges lighter than ⅛ inch. If we turn back the pages of history to the early days of fabricating aluminum with the blowpipe we shall perhaps find some logical reason why oxy-hydrogen gained popularity in the welding of the lighter gauges. At that time commercial oxygen was largely produced by the electrolytic process, so that the sources of hydrogen supply were relatively numerous and fairly well distributed. Today practically all commercial oxygen is produced by the liquefaction process, which has materially limited the availability of hydrogen except in the large industrial centers. Acetylene and carbide distributing stations are conveniently located everywhere. The small fabricator outside of the large cities who continues the use of hydrogen is therefore required to charge into his production costs an appreciable item for freight, to say nothing of the inconvenience of securing a commodity in a distant market.

Although certain metallurgical advantages were claimed for hydrogen in aluminum welding, it is probable that its popularity rested principally upon its lower flame temperature, which made possible the welding of the metal by less skilled operators. The agencies for instructing operators in welding aluminum were not at that time as well developed as at present and this was an important factor from the standpoint of getting men quickly into production work. It is also to be noted that there were not available at that time the excellent fluxes and rods for aluminum welding which are found on the market today, so that it was natural for fabricators of aluminum to follow the course of least resistance without too close scrutiny of production costs. In spite of the use of the best practices then known some weld failures resulted so that it seemed illogical to impose a greater burden upon the skill of the operator incident to the use of acetylene. This refers particularly to welding the alloys, which the advent of the silicon alloy aluminum rod has greatly simplified by eliminating the delicate preheating and cooling operations which were essential for successful results. So you will observe that in the last decade the methods and materials for welding aluminum have progressed to such a point that satisfactory fabrication of even quite intricate designs presents no problem.

Comparison of Flames and Temperatures

It is not the purpose of this paper to dwell upon the technique of aluminum welding, but rather to direct your attention to the cost of welding by the two blowpipe methods heretofore mentioned, An intelligent discussion of this matter should comprehend a knowledge of the characteristics of the two flames. The use of hydrogen in combination with oxygen unquestionably antedates the oxy-acetylene process, but because of its relatively low flame temperature has been practically superseded by oxy-acetylene for all welding applications with the possible exception of lead burning. The oxy-hydrogen flame is produced by a combination of two volumes of hydrogen with one volume of oxygen forming water vapor. It was early found in blowpipe welding with oxy-hydrogen that the water vapor which is produced exclusively and abundantly provokes considerable oxidation of the molten metal at the welding temperature and that all efficient joining was impossible. The only artifice which would mitigate the deleterious effect of the neutral hydrogen flame was to dilute the water vapor with an excess of

hydrogen if good welds were to be anticipated, so that the theoretical proportions of gases was raised from two to three, or even four, volumes of hydrogen for one volume of oxygen. In spite of this artifice of using excess hydrogen the undesirable oxidation is not entirely eliminated. The necessity for using an excess of hydrogen in the oxy-hydrogen flame has been amply borne out in observation of relative volumes of oxygen and hydrogen during production operations. It may also be easily verified by allowing a properly adjusted oxy-hydrogen blowpipe to burn over a period of an hour and measuring the relative gas volumes. This is an interesting test as compared to the equivalent oxy-acetylene flame for the same speed of welding.

Contrast with this the oxy-acetylene flame. Theoretically, it requires 2½ volumes of oxygen to completely burn 1 volume of acetylene. Practically, it is necessary only to furnish approximately one volume through the blowpipe, the additional required oxygen being supplied from the atmosphere surrounding the burning envelope. The initial stage of the combustion of acetylene with an equal volume of blowpipe oxygen produces hydrogen and carbon monoxide as intermediate products. These serve the important function of a protective gaseous atmosphere about the weld strongly reducing in character, which eliminates the formation of oxides detrimental to good weld quality.

Considering the fundamental characteristics of the two flames, it is obvious that the oxy-acetylene flame has certain innate properties which make it infinitely more desirable in fusion welding than the oxy-hydrogen flame, which in its neutral condition is unsuited to such operations. Because of the low visibility of the hydrogen flame it is quite difficult to adjust it always to the same condition; the neutral oxy-acetylene flame is easily and quickly attained without a trial melting of the metal. As is well known, the hydrogen flame is a long, bushy, diffuse flame as compared to the short, concentrated flame of the oxy-acetylene blowpipe, and it is apparent that in the application of these flames the hydrogen flame necessarily heats up a larger area and does not permit of the efficient heat utilization possible with the oxy-acetylene blowpipe. This immediately becomes a consideration in welding aluminum, as the coefficient of expansion of this metal in almost twice that of steel, and in order to minimize distortion it is desirable to accomplish the welding as fast as possible with a source of highly localized heat. The temperature of the oxy-hydrogen flame is nearly 2000° F. lower than the oxy-acetylene flame. I do not mean to imply in drawing your attention to the elemental properties of these two flames that good welds cannot be made in light gauge aluminum with oxy-hydrogen, for such is not the case, although the heat of the oxy-hydrogen flame is entirely inadequate in the welding of the heavier gauges for which oxy-acetylene is universally employed.

Because of the lower flame temperature of oxy-hydrogen, less skill is demanded of the welder, although new operators are just as easily trained to use acetylene as hydrogen. It has been some times contended, though not in recent years, that there was a deposition of carbon during welding with oxy-acetylene which was not present in using hydrogen. We have observed oxy-hydrogen welding where this same reaction obtained, and we are inclined to believe that whatever the cause it has no bearing on the physical properties of the resultant weld, nor does it contribute to additional cost in the finishing operation.

Comparative Properties of Different Welds

Preference for hydrogen is often predicated on the theory of better physical properties in the weld. This claim is unsupported, not only by the service of oxy-acetylene fabricated aluminum products over a long period, but it has been definitely proved through careful research that no significant difference exists between the physical properties of welds produced by the two methods. Equal welding speed, if not greater, is possible with the higher flame temperature of oxy-acetylene. With the efficient fluxes, rods and improved technique which have been developed, there is little reason from the standpoint of equality of physical results to continue the use of oxy-hydrogen welding, particularly when the cost is decidedly in favor of acetylene.

This fact recently became apparent to a large manufacturer of aluminum furniture, and the general manager and metallurgist cooperated in a series of production tests to determine the actual facts as to relative merit of welding aluminum by oxy-acetylene and oxy-hydrogen. For this purpose one hundred aluminum chairs were welded; fifty by oxy-acetylene and fifty by oxy-hydrogen. The plant operators had used oxy-hydrogen for many years and were inexperienced with oxy-acetylene. The results they achieved were therefore the more remarkable. Five operators participated in the tests, each being a specialist on some phase of the welding operation. The normal time for welding fifty chairs was nineteen hours. The welding time with oxy-hydrogen was 21.1 hours and with oxy-acetylene 24.9 hours. The difference in time was rightly attributed by the Management to the inexperience of the operators, all tests heretofore having shown equal or better speed with the hotter oxy-acetylene flame. The finishing time was identical, as was the chair strength determined by accelerated fatigue tests for chair life. There was no difference in the appearance of the welds.

Comparative Gas Consumptions

Of more significance are the relative consumptions of gases. Let me remind you that we are comparing equal amounts of useful work in the shape of aluminum welded production. The fifty oxy-hydrogen welded chairs required 485 cubic feet of hydrogen and 212 cubic feet of oxygen, a ratio of about 2.3 to 1, which indicates very efficient use of this flame. The fifty oxy-acetylene welded chairs consumed 169 cubic feet of oxygen and 159.5 cubic feet of acetylene. Approximately 25 per cent more oxygen was required in doing the same amount of aluminum welding with hydrogen as a fuel as compared to acetylene.

On the basis of prices paid for gases by this manufacturer, the oxy-acetylene method using dissolved acetylene, shows a 30% saving in welding costs, which is increased to approximately 47% if generated acetylene is substituted, a logical installation for such large scale production welding. A check of many other fabricated aluminum jobs tells the same story with resultant savings for oxy-acetylene and usually in larger degree, as the tests referred to represented the use of oxy-hydrogen under the best possible conditions by most experienced operators.

Oxy-Acetylene Method Cheaper

The acetylene industry is desirous of expanding its market for acetylene and carbide and the producers of aluminum wish to see a much larger use of fabricated aluminum. Our common interests can be most quickly attained by a unanimous recommendation for the oxy-acetylene welding of aluminum and its alloys in all gauges. It has been proved and amply demonstrated that metallurgically, welds produced by oxy-acetylene are equal to those produced by oxy-hydrogen in every respect, and what is much more important, at lower cost.

A New Process of Electrolysis Which Produces Rare Metals in Pure State

A NEW method of electrolysis for obtaining such rare metals as uranium, thorium, and tantalum in the pure state has been developed by Dr. Frank H. Driggs and his associates in the metallurgical research laboratories of the Westinghouse Lamp Company, Bloomfield, N. J. It is a continuous process, and is expected to make rare metals available in larger quantities and at cheaper prices, thereby extending their industrial uses either separately or as alloys.

In this new process, a cathode is inserted in a liquid bath containing equal parts of sodium and potassium chloride to which has been added a quantity of potassium thorium fluoride when the metal thorium is desired. After powdered thorium has collected on it to a thickness of about one inch, the cathode is removed and replaced immediately with another cathode, which makes the process continuous. It is not necessary to destroy the entire bath in order to obtain the metal deposits.

Dust of the rare metal uranium is self-burning at room temperature, and here Dr. Frank H. Driggs is seen emptying a small glass tube of this powdered metal into the air at the research laboratories of the Westinghouse Lamp Company, Bloomfield, N. J. The huge glass globe at Dr. Driggs' right is a vacuum induction bottle in which pressed bars of the powdered metal are heated by induction until they are transformed into a molten or ductile state more suitable for drawing and working into alloys.

High Speed Oxidation

Some rare metals in the powdered state oxidize so rapidly at room temperature that extreme care must be exercised in this process else the powdered metal will "go up in smoke." As the cathode is removed from the liquid bath, the salty solution clinging to it temporarily protects it from oxidation. When the solution is washed away, however, the powder must be preserved in an atmosphere of ether or in a vacuum. In pressed bars, the metal does not oxidize at room temperature and can be handled freely.

To get these metals in the molten or ductile state the bars are placed inside induction coils of vacuum induction bottles and subjected to high temperatures until they are suitable for drawing and working into alloys.

Uses Limited

Now that these rare metals are more readily available, their field of application in industry is broadened considerably, according to Dr. Driggs.

Uranium is light sensitive only at short wave lengths and is used in photo-electric cells at meters which measure the strength of ultra violet radiations. X-ray tubes will operate more efficiently with plates and cathodes of pure thorium or uranium, but since these metals melt at low temperatures, they have not yet proved as practical as the tungsten now used under the intense operating heat of these tubes.

Perhaps the most practical application of rare metals to date is in gaseous tubes, such as those used in electric signs, radio tubes, and for some applications of interior illumination. Being radio active, uranium and thorium as electrodes cause gases to ionize at room temperature and thereby permit lower starting voltages.

EDITORIALS

Platers' Dangers

IT is time for the platers—the practical men at the tanks—to take stock of their position. Several forces are making it imperative, especially at this time.

1. Hard times have resulted in fewer jobs.
2. The unmistakable trend of the times is to substitute machinery for "skilled labor."
3. Due to the severe business conditions the false idea is being pressed upon credulous manufacturers that a plating "consultant," by means of periodic visits, can operate a plating department without the plater; with only the unskilled helper or even girls at the tanks, thus "saving" the cost of a plater.
4. The growing interest of the large manufacturer in the idea of using automatic equipment, a competent chemist (not necessarily a practical plater) and unskilled help at the tanks—without the plater—to get a high quality job at lower cost.

The electroplater in the United States is definitely facing these dangers. What is he to do?

He must face the facts. Statements 1 and 2 above are absolutely correct. Hard times are making jobs fewer; the trend of the times is to install machinery to replace skilled labor.

The idea that a consultant can operate a plant by making weekly visits, is of course, not only false, but dangerous. Time will always prove this plan to be defective, at the expense of the manufacturer who tries it. But such mistakes result in suffering for the plater displaced in the meantime.

The fourth factor, the possible displacement of the practical plater by automatic equipment and the chemist to control solutions, must be closely watched. There is no doubt that good machinery and a good chemist, together with even unskilled help, properly supervised, are in many cases a better combination than a plating plant operated by an unprogressive, rule-of-thumb plating foreman. Every intelligent manufacturer knows, however, that no plating shop, however modern in its equipment and methods of control, can work as well without a live-wire practical plater as it can with one. The perfect combination, not only from the standpoint of quality of output but also for ultimate low cost operation, is the most modern equipment, chemical control **and a good, practical plater.** Such a chain has no weak link.

The practical plater must wake up to his situation. He must bring himself up to date and stay there. It is his duty to himself and to his industry to learn and practice constantly:

1. Solution control by chemical analysis.
2. Keeping a clean and orderly plating room.
3. Maintaining the most careful inspection of the quality of his output, within the limits of the cost allowed for the job.
4. Exercising the most careful supervision of the condition of his equipment, allowing nothing to fall into disrepair for lack of attention.
5. Keeping up to date on progress through the literature and meetings in his profession. He must know what is happening everywhere and take advantage of every improvement in the electroplating art, which is rapidly becoming a science.

In a word, the practical plater must get out of the "skilled labor" class. He must become a technical man retaining a practical mind. If he does not, he is in danger of extinction.

Why Modernize?

IN these days, everyone's first answer to a salesman's suggestion to buy is a question—"Why should I?" It is the proper answer. So when the manufacturer is advised to modernize his facilities for production, distribution and marketing, here are the reasons in answer to his question "Why should I?"

1. To reduce costs and make more profit. (Perhaps the words "more profit" should be changed to "a profit").
2. To improve his competitive position on present business.
3. To provide for efficient production when a normal volume of business returns.

Then the prospect asks, "Why should I buy now? Maybe it will pay me to wait." And the answers to this point are fully as cogent as the answers to his first question. They are as follows:

1. Equipment can be purchased and installed today at a cost below normal.
2. Changes in equipment can be made now most easily while plants are not busy.
3. Recent rapid improvements in equipment design offer unusual opportunity for cost reduction.

Here is concrete evidence. Buyers of equipment today get more for their dollar than ever before. According to H. S. Beale, manager of the Jones and Lamson Machine Company, the machine tool industry realizes that its business volume depends on (1) the amount which labor is paid for its services (2) the productivity of the machine (3) **the price at which it sells.** In other words, the price of a piece of labor-saving equipment is no longer of secondary importance. It is checked as closely as the price of raw materials. That the machine tool industry understands the problem of the buyer of machinery is clear from the statement of H. P. Bailey, president of the Rotor Air Tool Company, to the effect that "The fundamental problem of the seller of industrial equipment at the present time is to prove to the buyer the net profit which will arise from the purchase of his equipment." So much for the element of cost and price. In addition we have the fact as stated by J. H. Macleod, vice-president of the Hinde and Dauch Paper Company that "Performance of free service has increased greatly in recent years due to the creation of technical staffs as an adjunct to the sales department and the direct addition to the sales manager's staff of sales engineers for whose service a charge is rarely, if ever, made." In a word, service is given free with the purchase of equipment.

Nor is an injunction "Modernize your plant now" meant only for the large corporation. According to census figures, the plants which employ 500 or fewer workers, employ collectively almost 62 per cent of the total working population. Plants employing 100 workers each or less, include 28.8 per cent of wage earners, a larger number than the 24.1 per cent employed by the large establishments with more than 1,000 workers each. Success is not confined to the large plant. Small companies are also highly successful, depending upon the alertness and ability of the management. The small plant must also keep its equipment up to date in order to compete with the large organization.

The answer is both short and clear. Put your own plant in order now.

Technocracy

TECHNOCRACY, a cleverly devised name, has had such a meteoric rise in public interest that whether we agree with it or not, it behooves us to find out what it is all about. Its meaning has been obscured by the noise of public clamor, but it may be stated that it represents the name of a group of engineering and economic investigators, the technical findings which they have obtained and the conclusions which they have drawn from these findings. Said findings, briefly, are that technology has progressed so fast that the world requires only a small proportion of its present workers to feed, clothe and house the total population; that consequently we have a large and growing body of unemployed; that this situation is permanent and will become worse. Lastly, as a result of these conclusions the "price system" under which our society is operating at the present time, is doomed to extinction; that we must change to another measure of payment for work, such as "energy units."

The question of the validity of any statements must be judged by the soundness of the statistics in back of them and the completeness of the data. In this respect, the following seems to be the case about Technocracy:

1. The original data, calculations, sources, etc., from which the investigators have obtained their findings, have not been divulged.
2. Those statistics which have been made public are "end points," largely without explanation of the methods or technique by which they have been obtained.
3. Many of the "end point" figures have been shown to be inaccurate or incomplete or both.
4. No proof, statistical, logical or otherwise, has been put forward to substantiate the statement that the price system is doomed.

The question of technological unemployment has been discussed for years, but according to the Technocrats, although in the past the unemployment caused by the advent of machinery was quickly taken up by the new industries created by machinery, although in the past the machine has provided more jobs than it has destroyed, this cannot be the case in the future as there is now only a short lag between the advent of a new industry and the use of improved equipment therein. Production methods are improving at a more rapid pace than industry is expanding.

The findings of the Technocrats, if their statistics have been gathered carefully and their mathematics are correct, will be of value in charting the past. Their conclusions about the future, however, have all the earmarks of guesses, by the extension of curves in a straight line, and by long jumps to conclusions which are as startling as they are distant from the facts upon which they are supposed to be based. Add to this their inaccuracies in figures and their unwillingness to divulge sources, methods of calculations, etc., for proper checking, and we have a situation which to say the least, fails to create confidence.

The suspicion has become strong that they are propagandists for a new social doctrine in which they believe and to which they have twisted their findings, rather than scientific investigators who first get the facts and then draw logical conclusions therefrom.

What About Silver?

SILVER is again in the public eye, mainly for political reasons, as it is the subject of numerous debates and controversies between leading politicians of many nations on the question of remonetization. The Annual Review of the Silver Market, issued by Handy and Harman, is still the most enlightening information obtainable on this metal.

The strength which the silver market showed at times during the past year was due almost entirely to speculative buying, but in the absence of important changes in basic conditions, speculative influence was insufficient to maintain prices. The largest factor affecting silver was the unprecedented shrinkage in demand from India and China. As the enhancement of silver by remonetization is too far-fetched to consider seriously at this time, an economically sound higher level for the metal depends entirely upon increased demand for it from the Far East. Such demand can come only when India and China can sell their products in greater volume and at higher prices. This improvement will come only with a revival of trade and a higher price level for commodities.

In other words, improvement in silver, like so many other raw materials, waits for improvement in world business conditions.

Beauty Sells Metal Products

THE manufacturers of metal products which go directly to the consuming public have always been aware that appearance is important. The plating industry is to a considerable extent based on the factor of appearance. Now as never before, however, metal goods manufacturers are convinced that art, finish and form are of the utmost importance as sales factors. This was startlingly clear at the recent exhibition of new materials, new products and new uses assembled by the National Alliance of Art and Industry, Inc., in New York from January 16 to February 16. At this exhibit, products were shown in a wide variety of design and beauty of finish in silver, nickel and nickel alloys, zinc in the form of die castings (electroplated and finished), copper, brass, bronze and other copper base alloys, aluminum in all colors, made into scientific instruments, kitchen utensils, toys and decorative household and building fixtures. All metals and all finishes were employed.

The driving force behind this movement is clear, of course. The sales appeal of beauty is strong, but it must be soundly conceived from the financial point of view or it will be wasted. According to Abbott Kimball, a prominent advertising man, "Beauty not founded on facts and not backed up by sales strategy is so much effort and money wasted, but beauty soundly organized will and does make profits."

It costs no more in most cases to make an attractive object than an ugly one. It calls only for care and forethought in its design—and there is no excuse for the omission of beauty in the design and finish of metal products.

Fake Advertising

WE are told that an old "industry" is beginning to revive—the publication of "puff sheet." The **modus operandi** of this type of publication is as follows.

A man representing himself to be editor of a business magazine, usually "of national circulation" calls up a prominent business man, reads him an article about himself (that has been rewritten from a legitimate publication), gets an O.K. on it, and then offers extra copies at so much a hundred. If the victim falls, the "editor" sends up a confirming order to be signed and returned. When he has sold enough write-ups to insure a profit, he gets a printer to produce a publication, delivers the copies and receives good money for them. That is all there is to it.

The circulation of such magazines is usually non-existent. The fact is that if a publication with which you are not familiar offers to sell bulk copies of an issue containing an article about your business, it is a "puff sheet." Its circulation will do you no good. Your money will be wasted.

Correspondence and Discussion

Rustproofing Tire Wire

To the Editor of METAL INDUSTRY:

In reference to Shop Problem No. 5,149, in your issue of November, 1932, entitled "Rustproofing Tire Wire":

This question interests me, as a few years ago, as a consulting engineer in electroplating, the same problem was put before me by an English firm, Messrs. British Ropes, Ltd., of Cleckheaton, England, and I think I solved it satisfactorily and at low cost. After making trials in a one-wire trial vat, they made their own plant after my drawings, and they were able to pull the wire through at a speed of 180 feet per minute, while the length of the copper vat was 28 feet. The coating required, however, was much less than what is necessary for actually rustproofing the wire by a coating of copper. Still, I do not think you would have any trouble at all with rusting if you only applied proper means of drying the wire after copper plating. With the said plant I pulled the wire at the end through very hot water, and after that through a piece of tube heated by gas. The samples I have left are three years old and do not show any rust even though the coating is only some .001 mm. thick (this comes to 4 grammes of copper per 1000 grammes of wire of 1 mm. diameter).

It seems to me the question you put, viz., "How can I get a coppered wire rustproof" is not answered in the METAL INDUSTRY. Mr. Sizelove says: "Cadmium plate it or zinc plate it," but you must have copper. Personally, if you ask me how to make coppered wire that must be rustproof in such a way that it can be put out in the rain for a few weeks without showing any rust afterwards, I would never in my life go for a protecting by zinc or cadmium and copper plate on top of that. I would copper plate with a coating of maximum .0005 in. (increasing the diameter by .001 in.) and in the same operation give the wire a light draw so as to ensure a firm and non-porous coating.

In fact, I am convinced that for all articles made of steel wire, high or low tension, that need a decorative coating afterwards, nickel or chromium, such rustproof coppered wire would be very useful. As it is today, the wire or the articles made of it, are either rustproofed by means of zinc or cadmium, but do not have a nice decorative finish, or are given the nice finish by nickel or nickel-chrome without being sufficiently rustproof. I am sure the points necessary, viz., rustproof and nice decorative finish, can be combined on a commercial basis at very low cost.

However, for your job, a thin coating of copper and a quick drying is undoubtedly satisfactory. I enclose a piece of the wire finished about three years ago.

INGENIEURSBUREAU "LEMET CHROMIUM,"
H. Van Der Horst.

Hilversum, Holland.

New Books

Handbook of Industrial Temperature and Humidity Measurement and Control. By M. F. Behar. Published by Instruments Publishing Company. Size 6 x 9¼; 320 pages. Price $4.00.

Two separately titled books have been combined into one volume to make this book. There are as a matter of fact 4 departmental "handbooks" covered in this work which are of primary importance to industry: (1) Thermometry; (2) Pyrometry; (3) Automatic Control of Temperature; (4) Humidity Measurement and Control.

In addition to the basic and more theoretical considerations involved, the book includes a chapter on temperature recorders, of a distinctly practical nature, discussing freely the advantages and limitations of all types of mechanical and electrical graphic instruments. Appendices are also included made up of charts and tables.

The book will undoubtedly take its place as a standard reference work in engineering, industrial and metallurgical fields.

The New Psychology of Advertising and Selling. By Henry Link. Published by Macmillan Company. Size 5½ x 8½; 293 pages. Price $3.00.

This book is the work of a practical psychologist working with business problems in finding out what people will do. He points out that high pressure salesmanship and forcing a consumer to buy are being replaced with new methods. Successful firms are now using market research and outside types of advertising which are in line with consumer demands, and this is met with less resistance than the high pressure methods are subjected to.

A few chapter headings show clearly the type of work which this book is.

Sellers' Resistance; Technique of Market Surplus; What Is Good Advertising; Testing Advertisements; The Qualities of Salesmanship; What Will the Consumer Buy?; Consumer Reactions.

Industrial Psychology. By Morris Viteles. Published by W. W. Norton and Company. Size 6 x 9; 652 pages. Price $5.50.

This book is devoted to the discussion of the methods employed, the principles involved and the results accomplished by industrial psychology, in promoting the better adjustment of men in industry and increasing business efficiency. It is stated that stability in business depends upon the foundation of its personnel, no less than its economic foundation. It is as necessary to analyze the conditions which affect human behavior in industry as it is to analyze balance sheets. The author is a consulting psychologist of wide experience and high standing, having done important work for such concerns as Milwaukee Electric Light Company; Philadelphia Electric Company; Yellow Cab Company of Philadelphia, and others.

Some of the chapter headings will be indicative. The Economic Foundations of Industrial Psychology; Basic Factors in Vocational Selection; Standards and Administration of Psychology Tests; Tests for Skilled and Semi-Skilled Workers; Psychology Techniques in Accident Prevention; Motives in Industry; Problems of Supervision and Management.

Chemical Engineering Catalog. Published by Chemical Catalog Company, New York. Size 8½ x 11; 847 pages. Price $3 for permanent possession; free on an exchange basis.

This is the 17th annual edition (1932) of a work which has for some time been standard in the field of chemical engineering. It contains condensed and standardized data of equipment, machinery, laboratory supplies, heavy and fine chemicals and raw materials used in the industries employing the chemical processes of manufacture. It contains also a technical and scientific book section. The carefully cross-indexed, classified indices are of considerable help to the reader in finding the information required.

Technical Papers

Industrial Gas Research. American Gas Association, Inc., Cleveland, Ohio. Bulletins on the following subjects: Elimination of Noise in Industrial Gas Burners (Report No. 692); Study of Characteristics of Burning Gas with Preheated Air (No. 685); Standard Nomenclature for Industrial Gas Combustion Systems (No. 694).

American Recommended Practice for Foundry Patterns of Wood (B45.1—1932). American Standards Association, 29 West 39th Street, New York. (A reprint of CS 19 of National Bureau of Standards, adopted in 1930.) Price 10 cents.

Copper Wire Bars. American Standards Association, 29 West 39th Street, New York. Reprints of A.S.T.M. specifications B4-27 and B5-27, respectively on the following: Lake copper wire bars, cakes, slabs, billets, ingots and ingot bars; and electrolytic copper in the same forms. The A.S.A. designations are, respectively, H17.1—1932 and H17.2—1932.

Effect of Zinc Coatings on the Endurance Properties of Steel, by W. H. Swanger and R. D. France, Bureau of Standards, Washington, D. C. Research paper 454. Superintendent of Documents, price 5 cents.

ABSTRACT: The effect of the surface alterations, resulting from the application and presence of hot-dipped galvanized and electroplated zinc coatings, on the endurance properties of 0.02 per cent carbon open-hearth iron and 0.45 and 0.72 per cent carbon steels was determined by fatigue tests made with R. R. Moore rotating beam and Haigh axial loading machines.

Rotating beam tests were made on: (a) Polished but uncoated specimens, (b) specimens coated by the hot-dip galvanizing process, (c) zinc-plated specimens, and (d) on specimens acid pickled as for galvanizing. Axial loading tests were made on uncoated and galvanized specimens only.

The open-hearth iron was tested in the "as rolled" condition. The two carbon steels were tested in the normalized and annealed condition, in the quenched condition, and in the tempered condition, except that axial loading tests were not made on quenched specimens.

The results of the fatigue tests are given in conventional S-N diagrams and are summarized in a table, together with the results of tensile strength and hardness determinations. Photomicrographs showing the structures of the heat-treated steels and of the two types of coatings are given.

The endurance ratios (endurance limit: tentile strength) by the rotating beam method of test of the uncoated specimens varied from 0.38 to 0.70; by the axial loading method, from 0.31 to 0.59.

The decrease in fatigue limit from that of the polished uncoated materials caused by the acid pickling was more marked in the quenched steels than in the annealed and the tempered steels. The decrease varied from 0 to 40 per cent.

A still greater decrease, as much as 42.5 per cent, was caused by the presence of the hot-dipped galvanized coatings. The quenched and the tempered steels were affected more adversely than the annealed steels.

The fatigue limits of the zinc electroplated specimens were equal to or greater than those of the uncoated specimens.

The difference in the effects of the two types of coating is believed to be caused by the differences in the nature of the bond between zinc and steel and differences in the structure and hardness of the two coatings.

Solders and Soldering. Bureau of Standards, Washington, D. C. Circular LC343. Free from Bureau.

The circular was prepared in order to facilitate answering inquiries. Three classes of solders are described, viz., soft solders, hard solders (silver and brazing), and aluminum solders. The composition and properties of each are given, together with the methods of application and fluxes to be used, and a short bibliography follows.

Creep of Lead and Lead Alloys Used for Cable Sheathing, by H. F. Moore and N. J. Alleman, Engineering Experiment Station, University of Illinois, Urbana, Ill. Free.

The Structure of the Chromium Acid Plating Bath; the Theory of Chromium Deposition, by Charles Kasper. Bureau of Standards, Washington, D. C. Research Paper 476. Superintendent of Documents. Price 5 cents.

ABSTRACT: The structure of solutions that are of importance to the theory of chromium deposition from the chromic acid bath was investigated by cryoscopic and conductivity measurements, and absorption spectra. It was shown that the first step in the reduction of chromic acid is the formation of chromium dichromate, $Cr_2(Cr_2O_7)_3$, a strong electrolyte which forms negative molecular ions. This compound is found not to exist in the "green" form. The next product of reduction is the basic chromium chromate, $Cr(OH)_3{\cdot}Cr(OH)CrO_4$. This compound is a colloid, which may exist in relatively acid solutions. If sulphate is present, it forms chromic sulphate only the green form of which exists in chromic acid solutions.

If the basic colloid does not have its electrophoretic velocity reduced, it coats the cathode and prevents further reduction of chromic acid. The beneficial action of the sulphate is caused by the fact that it lowers that velocity by adsorption. The sulphate reaches the cathode film by being transported as a nonreactive positive molecular ion, $[Cr_4O(SO_4)_4(H_2O)_n]$.**

The above theory was confirmed by employing it to correlate facts and principles of chromium plating.

Thermal Expansion of Lead, by Peter Hidnert and W. T. Sweeney, Bureau of Standards. Superintendent of Documents, Washington, D. C. Price 5 cents.

Abstract.—Measurements have been made on the linear thermal expansion of three samples of cast lead between room temperature and 300° C. and the results have been correlated with data obtained by other investigators between 1740 and 1931.

A curve has been derived which shows the linear thermal expansion of lead between —253° and +300° C. The summary gives average coefficients of expansion for various temperature ranges between —250° and +300° C.

A comparison of the indirect results by Kopp and Matthiessen with the direct data by other observers, indicates that lead expands the same in all directions.

Metal Specifications. American Society for Testing Materials, 1315 Spruce Street, Philadelphia, Pa. A number of tentative standard specifications have been formulated and are available free in printed form by anyone interested. The Society solicits criticism. Titles and A. S. T. M. designations of the Tentative Specifications follow:

Zinc-coated (Galvanized) Iron or Steel Barb Wire. A 121-32 T.

Zinc-coated (Galvanized) Iron or Steel Telephone and Telegraph Line Wire. A 111-32 T.

Aluminum-Copper-Magnesium-Manganese Alloy Bars, Rods and Shapes. B 89-32 T.

Magnesium-base Alloy Sheet. B 90-32 T.

Magnesium-base Alloy Wrought Shapes (Other than Sheet). B 91-32 T.

Government Publications

United States Government publications are available from the Superintendent of Documents, Government Printing Office, Washington, D. C., to whom proper remittance should be made to cover price where a charge is mentioned. In some cases, as indicated, apply to governmental body responsible for publication.

Metal Industries in 1932. Advance Summaries. Bureau of Mines, Department of Commerce, has issued circulars on Zinc and Lead in 1932. Available from Bureau.

Wire Cloth. Bureau of Standards, Department of Commerce. Recommended revision of Commercial Standard CS36-31, for Fourdrinier Wire Cloth. Sheets free from Bureau.

Annual Report of the Director of the Bureau of Foreign and Domestic Commerce. Department of Commerce, Washington, D. C. Free.

Aluminum Alloy No. 3 (Aluminum-Manganese) Sheet and Plate. Federal Specifications Board, Washington, D. C. Proposed Federal Specification No. QQ-A. Available free from Board, which requests comment from interested parties within 10 weeks from December 10, 1932.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

ASSOCIATE EDITORS

Metallurgical, Foundry, Rolling Mill, Mechanical

H. M. ST. JOHN — W. J. PETTIS
W. J. REARDON — P. W. BLAIR

Electroplating, Polishing, and Metal Finishing

O. J. SIZELOVE — A. K. GRAHAM, Ph.D.
G. B. HOGABOOM — WALTER FRAINE

Dark Colored Mirror

Q.—Would you be so kind as to send us some information on the silvering of mirrors to a gun metal finish?

A.—By a gunmetal finish mirror you probably refer to what is known as the lead sulfide process which produces a dark colored mirror.

For this information write to the Superintendent of Documents, Washington, D. C., for "Circular of the Bureau of Standards No. 389." The price of this circular is five cents which should accompany the request.—O. J. S., Problem 5,170.

Dark Nickel from Barrel

Q.—In a barrel nickel solution, steel parts are being plated. The oil is removed in potash. The work is ball burnished, the soap is washed off, and then the articles rinsed in potash. Then follows a cyanide dip, then muriatic acid pickle, a rinse and then the barrel nickel solution. When the work is removed from the barrel it is put into a burnishing barrel to be burnished after plating.

Now I find that after the work is dried out in sawdust the nickel is not uniform. This item cannot be burnished too long for the reason that the parts bend very easily.

I find that they stain very easily as you can see in the sample which I am sending.

Now, what I would like to have is a uniform nickel which does not discolor so quickly. The sample enclosed is not satisfactory—it is not white enough.

A.—Analysis of nickel solution:

Metallic nickel	2.97 ozs.
Chlorides	1.99 ozs.
pH	6.8

The pH of the solution is entirely too high. This is the cause of the work staining and also the dark color of the deposit.

To correct the pH it will be necessary to add 40 fluid ozs. of sulfuric acid to the 180 gallons of solution. This may seem like a very large amount of acid to add, but it is the correct amount that is needed to adjust the pH to 5.8.—O. J. S., Problem 5,171.

Defective Brass Solutions

Q.—Am sending you two samples of a brass cyanide plating solutions under separate cover. Will you please tell us what is wrong with these solutions?

Solution No. 1 works well on smooth surfaces, but I have trouble getting the recessed parts a brass color.

Solution No. 2 in which we are using all copper anodes, plates well the first hour of operation; then the anodes coat over, which causes the work to take on a bronze color. Originally this was a copper cyanide solution, but has been changed to brass, by adding zinc cyanide.

USE THIS BLANK FOR SOLUTION ANALYSIS INFORMATION

Fill in all blanks if possible.

Date .....

Name and address: .....**Employed by:** .....

Kind of solution: .....**Volume used:** .....

Tank length: .....**width:** .....**Solution depth:** .....

Anode surface, sq. ft.: ..... **Cathode surface, sq. ft.:** .....

Distance between anode and cathode: .....**Kind of anodes:** .....

Class of work being plated: .....**Original formula of solution:** .....

REMARKS: Describe trouble completely. Give cleaning methods employed. Send small sample of work showing defect if possible. Use separate sheet if necessary. _____

NOTE: Before taking sample of solution, bring it to proper operating level with water; stir thoroughly; take sample in 2 or 3 oz. clean bottle; label bottle with name of solution and name of sender. PACK IT PROPERLY and mail to METAL INDUSTRY, 116 John Street, New York City.

After a year's operation of a brass cyanide solution, is it necessary to add conducting salts? If so, what is used?

The work is placed in an electric cleaner, swabbed off, rinsed and then plated in the brass solution for 30 minutes, allowed 24 hours to sweat out, then color buffed on a leather wheel, after which it is either lacquered or oxidized.

A.—Analysis of brass solutions:

1.	Metallic copper	3.24 oz.
	Metallic zinc	.60 oz.
	Free Cyanide	1.60 oz.
2.	Metallic copper	5.25 oz.
	Metallic zinc	.50 oz.
	Free Cyanide	2.31 oz.

The free cyanide content of No. 1 solution is too low. Add 25 lb. of sodium cyanide to this solution. The No. 2 solution is in poor condition. Would suggest that you take 120 gallons of the solution from the tank, then add 12 lb. of zinc cyanide, and 37 lb. of sodium cyanide and fill the tank to proper solution level with water. The zinc cyanide and sodium cyanide should be dissolved in warm water before adding to the solution.

Brass solutions give more uniform results if operated at 85°F., so it is advisable to have a steam coil placed in the tank so that the temperature of the solution may be controlled. If the solution plates a red color at this temperature the addition of a small amount of ammonia will overcome the trouble.

In brass plating cast iron a more uniform color will be obtained if the work is plated in a nickel solution for 15 to 20 minutes before brass plating.

It is not necessary to add any conducting salts to a brass solution after the solution is in operation for a year or so.—O. J. S., Problem 5,172.

Imitation Gold

Q.—The following formula was given us for a brass deposit of imitation gold color on copper wire which is to be drawn down very fine:

Water	1	gallon
Proprietary Mixture	4½	ounces
Copper Cyanide	3	"
Cadmium Oxide	¾	"
Caustic Potash	1	"

With this formula we use pure copper anodes and cadmium metal sticks. In a twenty gallon solution we added ten additional ounces of the proprietary mixture to the above formula as all the metals were not dissolved.

The plated wire instead of being a brass color comes out steel grey like enclosed samples. The sample with the darker shade (No. 1) was given less current density than sample No. 2. The brass sample (No. 3) is what we are trying to match by plating. This was not plated but is an alloy.

During the plating a vigorous evolution of gas bubbles comes off the wire. This might be due to the extra cyanide that we added which was not called for in the formula.

Any information you can give us on the above would be very greatly appreciated.

A.—We do not believe that you will ever be able to obtain the finish desired from the copper-cadmium solution that you are using. If you wish to experiment further, use the formula given with the exception of the cadmium oxide. Then dissolve ¼ of an oz. of cadmium oxide and ½ oz. of sodium cyanide to each gallon of solution in 2 quarts of water, add this to the solution, small quantities at a time until you have obtained the color as closely as possible. The original formula contains too much cadmium oxide.—O. J. S., Problem 5,173.

Pitting Nickel

Q.—Under separate cover, parcel post, we have forwarded for analysis report and instructions for the corrections required, two bottles containing samples from our two nickel solutions.

Enclosed herewith are two forms taken from METAL INDUSTRY which we subscribe to, duly filled in, answering the questions which you require in order to make a proper report re analysis.

Will appreciate receiving full information as to the conditions of our solutions, the required corrections to stop the pitting, and the metallic content. If you can give us this information as soon as possible it will be greatly appreciated as we have some present orders and do not want them to go through and come out defective.

A.—Analysis of nickel solutions:

1.	Metallic nickel	2.08 ozs.
	Chlorides	2.84 ozs.
	pH	5.2
2.	Metallic nickel	1.81 ozs.
	Chlorides	3.12 ozs.
	pH	5.2

The metal and chloride content of both solutions are too low. Add to No. 1 solution 75 lbs. of single nickel salts and 24 fluid ozs. of 26° ammonia. Add to No. 2 solution 40 lbs. of single nickel salts and 10 fluid ozs. of 26° ammonia.

The anode surface in both tanks is too small and should be increased. To stop the solution from pitting would suggest that you use 100 volume hydrogen peroxide instead of the sodium perborate. This material will last longer and less can be added to obtain results.—O. J. S., Problem 5,174.

Removing Fire Scale

Q.—Enclosed you will find samples of tempered steel with a fire scale on it. I would like to know how I can remove the scale so that I can plate directly without burnishing. I tried a 10% and 20% muriatic pickle but it doesn't remove it all.

These pieces cannot be put into cyanide because they would break.

I would like to put them on racks, strip off scale, then tin-plate.

A.—We are returning to you the samples with the scale removed The procedure used was as follows: cleaned in an electric cleaner, rinsed in hot water, dipped in muriatic acid which was used at 160° F. for 15 seconds, rinsed in cold water, dipped in hot cyanide dip for 1 minute, then rinsed in cold water, then hot water, and dried in sawdust.

The muriatic acid that was used was concentrated 22° Baume. The cyanide dip contained 6 ozs. of sodium cyanide to 1 gallon of water.—O. J. S., Problem 5,175.

Zinc on Rusted Castings

Q.—We are sending you under separate cover a grate or grid casting that we manufacture.

You will note thereon what we term "rust spots." These spots appear after the castings are sandblasted and while they are on the way to the plater. Once there, they are placed in a bath of muriatic acid, followed by a neutralizing bath, then plated with 100% pure zinc.

Some of the castings are entirely free of spots, others have more or less of these defects. But the plater on the whole, is having considerable trouble turning out a worthwhile job, regardless of the condition of the castings.

We have handled these parts as carefully as we know how, and have made it a point to ship these out only when atmospheric conditions were ideal, so we cannot blame this on the weather.

We understand other firms have a similar grate, plated in the same manner as the sample submitted, and we are wondering if you perhaps knew what steps they took to eliminate their troubles.

What we would like to know, is how to eradicate these particular spots and also what procedure the plater should take to turn out first class castings plated in pure zinc.

A.—It is almost impossible to prevent the castings from rusting after sandblasting if they are allowed to remain in the atmosphere for any length of time before plating.

The procedure for plating is to use a hot muriatic dip to remove the rust and then a hot cyanide dip to neutralize the acid that is left in the pores of the casting from the pickling operation. We are inclined to believe that the trouble is due to the condition of the zinc plating solution, and not to the cleaning operation before plating. Zinc cyanide solutions do not give very satisfactory results when used for plating castings. It is advisable to plate the work for a few minutes in a cadmium solution before zinc plating. Deposits of zinc from the sulphate bath usually have a more pleasing appearance. Although the throwing power of the sulphate bath is not as great as that of the cyanide bath, it will be great enough for your class of work, as sample submitted.—O. J. S., Problem 5,176.

Patents

A Review of Current Patents of Interest

Printed copies of patents can be obtained for 10 cents each from the Commissioner of Patents, Washington, D. C.

1,885,700. November 1, 1932. **Electroplating and Process of Producing Same.** Colin G. Fink, New York, N. Y.

1,885,701. November 1, 1932. **Tungsten Plating and Method of Producing Same.** Colin G. Fink and Frank L. Jones, New York, N. Y.; said Jones assignor to said Fink.

1,885,702. November 1, 1932. **Substantially Pure Tungsten Plating and Process for Producing Same.** Colin G. Fink, New York, N. Y.

1,886,218. November 1, 1932. **Gun Barrel and Process of Finishing the Same.** John M. Olin and Alfons G. Schuricht, Alton, Ill., assignors to Western Cartridge Company, East Alton, Ill.

1,886,251. November 1, 1932. **Magnesium-Manganese-Zinc Alloys.** John A. Gann, Midland, Mich., assignor to The Dow Chemical Company, Midland, Mich.

1,886,252. November 1, 1932. **Casting Freely Oxidizable Metal.** John A. Gann and Manley E. Brooks, Midland, Mich., assignors to The Dow Chemical Company, Midland, Mich.

1,886,615. November 8, 1932. **Manufacture of Composite Metal Sheets.** Wallace C. Johnson, Morristown, N. J., assignor to The Plykrome Corporation, New York, N. Y.

1,886,938. November 8, 1932. **Process of Reclaiming Lead.** Roy Cuming Brett, Cleveland Heights, Ohio, and James E. Doyle, Webb City, Mo., assignors to The Eagle-Picher Lead Company, Chicago, Ill.

18,652. Re-issue. November 15, 1932. **Casting Readily Oxidizable Metals.** William W. Smith, Buffalo, N. Y., assignor to Dow Chemical Co., Midland, Mich.

1,887,841. November 15, 1932. **Zinc Aluminum Mercury Anode for Electrodeposition of Zinc.** George B. Hogaboom, New Britain, Conn., assignor to Hanson-Van Winkle-Munning Company, Matawan, N. J.

1,887,870. November 15, 1932. **Rolling Mill.** James R. Coe, Waterbury, Conn., assignor to The American Brass Company, Waterbury, Conn.

1,887,967. November 15, 1932. **Composition for Coating Metals and Method of Making the Same.** Robert R. Tanner, Detroit, and Van M. Darsey, Morenci, Mich., assignors to Parker Rust Proof Company, Detroit, Mich.

1,888,188. November 15, 1932. **Stainless Silver Alloy.** Tadashi Tanabe, Torigai, Fukuoka, Japan.

1,888,189. November 15, 1932. **Coated Metal Article and Method of and Composition for Producing Said Article.** Robert R. Tanner, Highland Park, and Van M. Darsey, Morenci, Mich., assignors to Parker Rust Proof Company, Detroit, Mich.

1,888,202. November 15, 1932. **Zinc Aluminum Anode for Electrodeposition of Zinc.** Arthur K. Graham, Sea Girt, N. J., assignor to Hanson-Van Winkle-Munning Company, Matawan, N. J.

1,888,567. November 22, 1932. **Wrought Zinc Product.** Willis M. Peirce, Palmerton, Pa., assignor to The New Jersey Zinc Company, New York, N. Y.

1,889,147. November 29, 1932. **Method and Mold for the Local Strengthening of the Silver Coating of Galvanically Silvered Spoons and Forks.** Hermann Krüger, Karlsruhe, Germany.

1,890,013-4. December 16, 1932. **Lead Alloy.** Reginald Scott Dean, Riverside, Ill., assignor to Western Electric Company, Incorporated, New York, N. Y.

1,890,094. December 6, 1932. **Copper Plating.** William Peacock, Jr., Philadelphia, Pa., assignor to Peacock Laboratories, Inc., Philadelphia, Pa.

1,890,164. December 6, 1932. **Sand Blasting Method and Apparatus.** William A. Rosenberger, Hagerstown, Md., assignor to Pangborn Corporation, Hagerstown, Md.

1,890,214. December 6, 1932. **Cleaning Composition.** Harry V. Churchill, Parnassus, Pa., assignor to Aluminum Company of America, Pittsburgh, Pa.

1,890,262. December 6, 1932. **Soldering Apparatus.** Arthur H. Pardew, Sherrill, N. Y., assignor to Oneida Community, Limited, Oneida, N. Y.

1,890,359. December 6, 1932. **Recovery of Tin.** Harry P. Bassett, Cynthiana, Ky.

1,890,502. December 13, 1932. **Buffing Wheel.** Bradford H. Divine, Utica, N. Y.

1,890,633. December 13, 1932. **Chromium Plating.** Elmer J. Waltz, Riverside, N. J.

1,890,645. December 13, 1932. **Process of Metallizing.** Max Ow-Eschingen, Vienna, Austria.

1,890,659. December 13, 1932. **Type-Soldering Device.** Edwin Thorell, West Hartford, Conn., assignor to Underwood Elliott Fisher Company, New York, N. Y.

1,890,666. December 13, 1932. **Bronzing Machine.** Frank R. Belluche, Racine, Wis., assignor to Christensen Machine Company, Racine, Wis., a Corporation of Wisconsin.

1,890,856. December 13, 1932. **Process for the Clarification of Electrolyte.** Tannie Lewin, University City, Mo.

1,891,495. December 20, 1932. **Alloy.** William H. Bassett, Jr., Scarsdale, N. Y., and Robert H. Leach, Fairfield, Conn., assignors to Anaconda Wire & Cable Company, New York.

1,891,546. December 20, 1932. **Brazing Rod.** Ottmar M. Krembs, Glencoe, Ill.

1,891,549. December 20, 1932. **Treatment of Aluminum Alloys.** Norman B. Lane, Niagara Falls, and William T. Ennor, Massena, N. Y.

1,891,703. December 20, 1932. **Method of Coating.** Helmer Bengston, Indianapolis, Ind., assignor to Aluminum Colors Incorporated, Indianapolis, Ind.

1,891,740. December 20, 1932. **Extruded Shapes with Interlocked Joints and Method of Making.** George F. Westerman, Ansonia, Conn., assignor to The American Brass Company, Waterbury, Conn.

1,891,894. December 20, 1932. **Die-Casting Machine.** Nathan Lester, Cleveland, Ohio, assignor to Precision Castings Company, Inc., Syracuse, N. Y.

1,891,978. December 27, 1932. **Process for Refining Lead.** Walter F. Gross, Elizabeth, and Charles N. Sappington, Perth Amboy, N. J.

1,891,979. December 27, 1932. **Method of Molding Graphite Refractory Compositions.** Albert M. Hanauer, Pittsburgh, Pa., assignor to Lava Crucible Company of Pittsburgh, Pittsburgh, Pa.

1,892,051. December 27, 1932. **Electroplated Chromium Article.** Daniel Gray, Oneida, and Burdette K. Northrop, Hamilton, N. Y.

1,892,172-180. December 27, 1932. **Method of Making Bearing Sleeves.** Berger Stockfleth, Niles, Mich., assignor, by mesne assignments, to The Cleveland Graphite Bronze Company, Cleveland, Ohio.

1,892,273. December 27, 1932. **Fusible Alloy and Method of Making the Same.** Wilford J. Hawkins, Brooklyn, N. Y., assignor to American Machine & Foundry Company, a Corporation of New Jersey.

1,892,740. January 3, 1933. **Metals Reduced from Their Oxides Without Melting.** William H. Smith, Detroit, Mich., assignor to General Reduction Corporation, Detroit, Mich.

1,892,840. January 3, 1933. **Aluminum Alloy.** Otto Kamps, Aachen, Germany.

1,892,950. January 3, 1933. **Removing of Enamel from a Metal Base.** Clayton S. Houpt, Detroit, Mich.

1,893,286. January 3, 1933. **Method of Carbonizing Metals and Alloys.** Charles V. Iredell, Bloomfield, N. J.

1,893,296. January 3, 1933. **Preparation of Metal Phosphides.** William C. Lilliendahl, Montclair, and Frank H. Driggs, Bloomfield, N. J.

1,893,301. January 3, 1933. **Die Casting Machine.** Oscar B. Norgren, Chicago, Ill.

1,893,221. January 3, 1933. **Method for the Electrolytic Deposition of Metals.** Harold Simmons Booth, Gilberta G. Torrey, and Menahem Merlub-Sobel, Cleveland Heights, Ohio.

Equipment

New and Useful Devices, Metals, Machinery and Supplies

Firm Finances Purchases of Equipment on New Plan

Improved Industries Corporation, 521 Fifth Avenue, New York City, recently announced that its purpose is to finance the purchase of equipment for modernization of industrial plants. According to R. G. Macy, president, the plan is novel, and, while it is a profit-making idea, it is said to place at the disposal of industry a service which is constructive and public spirited. The plan, briefly, is to finance for a company the purchase of equipment which will reduce unit production costs sufficiently to make the new equipment self-liquidating through the savings effected. Improved Industries Corporation finances the purchases and installations without notes, but retains title until it is paid for. Winston Paul is chairman of the board of Improved Industries.

Replying to an inquiry, Mr. Macy says: "Our plan is mainly applicable to medium-sized industrial plants which are interested in obtaining equipment to cut their costs. Our method of operation is to inspect the applicant's plant and ascertain the amortization rate of the equipment. If this equipment is amortized in a reasonable time, we then enter into a contract with the applicant in which we agree to purchase and install the equipment without the applicant advancing any cash or signing any notes. The cut in production cost is applied to repay the cost of the equipment, the interest on the outlay, and so forth. Title is held by our company until the transaction is completed, and then turned over to the applicant. Should a concern care to pay any part of the money the amount they pay will of course shorten the time as to when they receive the title."

New Process for Oxidizing and Coloring Aluminum

A new process for oxidizing and coloring aluminum and its alloys is now being marketed by the United States Research Corporation, 40-35 Twenty-First Street, Long Island City, N. Y., under the name Coloral. The details were worked out by the technical staff, which is headed by Dr. Colin G. Fink and Dr. L. C. Pan.

The company states that this process has been in commercial use for close to three years, and that it has proved not only highly efficient, but extremely economical as well, due to the simplicity of the process. No special equipment is needed as the bath does not require either agitation or temperature control. Other features claimed are as follows: the bath is permanently stable; it does not give off harmful sprays or fumes; the complete operating cycle for oxidizing and coloring is thirty minutes or less; processed sheets can be stamped or formed without affecting the finish; the process can be applied to aluminum or its alloys in all forms, including sand and die castings; any color or color combinations can be applied with uniform results.

The company's interest lies solely in the sale of the electrolyte for the bath and the material for coloring, charging no royalty for the use of the process, or any engineering fee for the installation of the cycle. For any manufacturer who uses or can use aluminum or its alloys in his product, the company has a booklet describing in detail the advantages of Coloral. The booklet describes the beauty of Coloral on jewelry, and economy with which Coloral can be applied to the cheapest castings, even though these castings are now painted or left unfinished. For the job electroplater, exclusive franchises are given.

New Sandblast Helmet

W. W. Sly Manufacturing Company, Train Avenue, Cleveland, Ohio, offers the "Purair" sandblast helmet, a new Sly development providing a number of features

"Purair" Helmet.

which resulted from considerable research. Chief advantages claimed are light weight, close fit, comfort, adjustable design, extra large vision frame with rubber-gasketed glass which can be protected by wire screen, and air inlet for pure, filtered air from a "Purair" blower unit. The design of helmet entails an aluminum frame and rubber hood made by the anode process. Provision is also made for attachment of helmet to compressed air line by using a Sly filter and purifier.

A complete illustrated leaflet on the new Sly helmet is offered by the manufacturer.

Latest Products

Each month the new products or services announced by companies in the metal and finishing equipment, supply and allied lines will be given brief mention here. More extended notices may appear later on any or all of these. In the meantime, complete data can be obtained from the companies mentioned.

Dynamic Weigher. Combines the speed of an automatic scale with the precision of a laboratory balance. Toledo Precision Devices, Inc., Toledo, Ohio.

Inconel. A new nickel base alloy including chromium, developed for the dairy industry. International Nickel Company, New York.

Finding a New Product to Manufacture or Sell. A service offered by The Blackiston Organization, Blackiston Building, Canton, Ohio.

Fan Seal Type Motors. A new line of fan seal type motors in sizes ranging from 2 horsepower at 900 R.P.M., to 30 horsepower at 1,800 R.P.M. Said to be self-cooling, self-cleaning and self-protecting. Marble Card Electric Company, Gladstone, Mich.

Vibrator Filling Machine. For packing small products, such as nuts, pins, washers, nails, etc., accurately and at low cost. Toledo Precision Devices, Inc., Toledo, Ohio.

Blue Midget Air Grinder. A hand grinder said to be the world's smallest and fastest, running at 40,000 R.P.M., weighing only 7 ounces, designed for tool makers, die makers and mechanics. Madison-Kipp Corporation, Madison, Wis.

Metal Container for Hobs. A modern packing method for delivering high speed steel, ground hobs to the customer. Barber-Colman Company, Rockford, Ill.

Hobart Welder. Fitted for handling both coated rods and plain rods at 42 volts and 25, respectively. Hobart Brothers, Troy, Ohio.

Acidseal Paints. Rubber derivatives that minimize the corrosive acids and alkalies on a wide variety of materials. Useful in plants using acids, chemicals, etc., for protection against these chemicals and fumes.

Expanding Polishing Wheel. Has an expanding aluminum wheel and a demountable endless abrasive belt.

New Aluminum Plating Process

Dr. Colin G. Fink, Professor of Electrochemistry at Columbia University, in an address Thursday, January 26, 1933, told the American Institute of Electrical Engineers of a new aluminum plate on

another which he stated was in many respects superior to tin plate. Steps will be taken to establish a plant in the Middle West. It is not planned to manufacture on a large scale at first.

He declared that the new product will be manufactured by an entirely new process.

New Electric Hydrogen Ion Apparatus

The Palo-Myers Inc., 81 Reade Street, New York, has developed a new electric hydrogen ion apparatus for determining acidity, which is applicable to electroplating solutions, such as nickel, chromium, etc. Some of the advantages claimed for this instrument are as follows:

1. Long distance control by wires.
2. No polarization at the poles.
3. Satisfactory with most any type of electrode.
4. Readings can be made by an unskilled operator.
5. No time lag in action of indicator.
6. Elimination of resistance effect in the cell and lead wires.
7. Measures any pH from 0 to 14.
8. Direct readings without calculations.
9. Will operate a relay for control purposes.

Arc Welding Equipment

Harnischfeger Corporation, 4400 West National Avenue, Milwaukee, Wis., has revised its line of P&H Hansen arc welders. The machines are made in a wide variety of sizes and types, for one or two man operation, with motor-generator equipment and also with gasoline engine drive. Stationary and portable units are available. Among the features of the revised line are a new magnetic bridge and short circuit winding which are said to greatly extend the welding range, while providing improved arc recovery and stability. New dead front control has been introduced to provide better appearance and simplified design.

A typical welder of the P&H Hansen line is shown in the illustration below.

New Silicon Bronze

Revere Copper and Brass Incorporated, New York, has announced a new patented and trade-marked alloy called Herculoy.

Herculoy falls into the silicon bronze group, and according to Dr. R. A. Wilkins, Metallurgical Manager of Revere Copper and Brass Incorporated, possesses the advantages of strength and corrosion resistance, which characterize the silicon bronzes, with special properties which render it more readily adaptable to fabricating operations than is usual with silicon bronzes. Below are the properties of Herculoy as given by its makers.

Properties of Herculoy

Its strength is comparable to that of low and medium carbon steel and its corrosion resistant qualities approximate those of pure copper.

Herculoy possesses a simple, single-phase structure, similar to that of alpha brass, thereby permitting through proper annealing a range of physical properties intermediate between the limits set for elongation and tensile strength.

These limits are as follows:

	Tensile Strength (lbs. per sq. in.)	Elongation (in 2 inches)
Hot Rolled Sheets	68,000	51%
Cold Rolled Sheets	85,000	30%
Cold Rolled Sheets, Light Annealed	75,000	56%
Cold Rolled Sheets, Full Annealed	60,000	80%
Hot Rolled Rods, (from a minimum of	67,000	60%
Cold Drawn (to a maximum of	125,000	10%

This alloy affords engineering designers and structural fabricators a non-rusting and non-magnetic metal, having among its other desirable qualities the ability to withstand extreme daily and seasonal temperature changes while over-stressed and exposed to weather, fog, gases, etc., and under such conditions it is not subject to stress corrosion cracking.

Herculoy in its wrought forms is so ductile that it may be stressed to the yield point without danger. It also has great resistance to shock and is easily hot forged.

A distinctive feature of Herculoy which differentiates it from similar alloys is the inclusion of tin in its composition. Through laboratory and practical tests, it has been found that tin exerts a peculiar effect of increasing the tensile strength and the ductility of this alloy simultaneously, and that in addition to generally improving the physical properties, the tin exerts a very pronounced influence on the resistance of the alloy to corrosion. The use of tin in causing a radical improvement in the properties of the copper-silicon-zinc alloys of high copper content is incorporated in the patent recently granted to Revere.

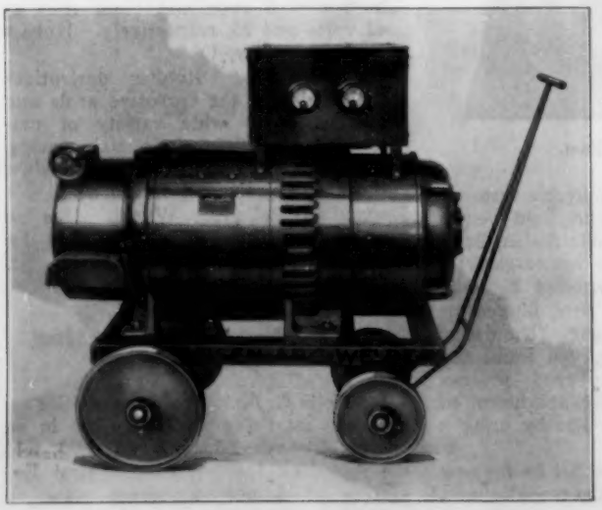
Herculoy is available at present in the form of sheets and plates; rolls and strips; rods, bars, and shafting; die pressed or hammered forgings; rivets; welding rods and in ingot form for sand castings.

Some of the more common applications of Herculoy are as follows: bolts, nuts, screw machine products, turn buckles, lag screw transmission line hardware, yacht fittings, accessories, etc., in which great strength and resistance to corrosion are desired.

In sheet and plate form, Herculoy is particularly suitable for tank construction.

Its resistance to corrosion renders lining unnecessary and it can be used in the same weight as steel. It is very readily welded with filler rod of the same composition, and the bond resulting is uniform throughout and insures freedom from selective or electrolytic corrosion.

Herculoy is also well adapted for electrical construction where its great strength, non-magnetic qualities, and resistance to abrasion are of particular value.



New Type Portable Arc Welder Made by Harmischfeger Corporation.

Metallic Zinc Paint

American Zinc Institute, Inc., New York, has issued some information of interest regarding metallic zinc paint, a product using metallic zinc powder or dust as the pigment and linseed oil as vehicle. The material is used extensively in Europe to decorate and rustproof structural steel bridges, towers, factories, etc. It is also gaining in use in the United States. It is characterized by high corrosion resistance, good adherence, battleship gray color, high flexibility, good hiding power, high spreading rate, and the ability to serve as either rust-inhibitive primer or finish coat. Numerous paint makers have already undertaken manufacture and distribution of this type of paint.

Rubber Equipment for Plating Shops

The Joseph Stokes Rubber Company of Trenton, N. J., manufactures a wide variety of rubber articles which are suitable for use in the electroplating industry. Besides hard rubber pipe and fittings, they make hard rubber tanks, rubber covered plating racks, acid pails (1 to 4 gallon-capacity) and hard rubber dippers (1 pint to 3 quarts capacity) which, it is stated are used very successfully for handling of acids employed in electroplating.

Their pipe and fittings are designed to stand a continuous working pressure of 50 pounds per square inch, when the temperature does not exceed 140 deg. F. As the temperature increases the working pressure must be decreased. All pipe and fittings are furnished with American Briggs Standard pipe thread so that they can be used with standard metal pipe and fittings wherever it is necessary to do so. Pipes can be furnished in all sizes from ¼ to 4 inches both in standard and extra heavy weight and any length up to 10 feet. In order to get the maximum strength of the pipe, the inside diameter is slightly smaller than on metal pipe. This variation in diameter must of course be considered when figuring volume flow.

Hard rubber pipes should never be installed close to any steam pipe and if necessary to run the pipes outside buildings, a suitable cover must be provided in order to protect the pipe from the weather.

The company has found that nearly all inorganic acids, alkalies, all caustics, hydrochloric, and hydrofluoric acids are handled successfully with their pipes. They recommend their equipment for handling the following chemical solutions when the temperature does not exceed 140° F.: acetic acid 10%; citric acid; caustic soda; caustic potash; ammonia solutions; chlorine solutions; hydrofluoric acid; hydrochloric acid; sulphuric acid, not over 50° Baume; all metallic salt solutions.

Die Coating Materials

A complete line of coating materials for permanent and semi-permanent molds and dies is made by the St. John X-ray Service Corporation, 505 Fifth Avenue, New York City. This material is being marketed under the registered trade name Bonis. It has been in use for some time in die casting plants for coating dies in which zinc base parts are cast. Now, however, similar material is available for aluminum castings, brass, bronze, iron and steel castings which are made in permanent molds and chill molds. It is claimed that all coatings work equally well on ingot molds, crucibles, pots and even as protection on refractories in furnaces.

Full details can be obtained from the manufacturers.

Compact Speed Reducer

Merkle-Korff Gear Company, 213 North Morgan Street, Chicago, Ill., offers a new type of compact speed reduction unit with enclosed motor drive. Wide range of application is possible due to small size of the device, which is 3⅛ inches in its largest dimension. Great variety of speeds are available, from motor speed of 3,000 r.p.m. downward, with rotation in either direction.

Merkle-Korff Speed Reducer.

Also, there are both horizontal and right-angle drives. A variety of motor types are also available. The maker states the unit can be used effectively as a power means at any desired speed, in numerous applications.

Voltage Drop Control for Plating Generators

Columbia Electric Manufacturing Company, 1292 East 53rd Street, Cleveland, Ohio, manufacturers of plating generators and kindred equipment, has devised a means of controlling variation of generator voltage between no load and full load, and has applied it to Columbia plating generators. Voltage drop has been a problem in plating generators which are shunt wound, and its control has hitherto been sought by means of separate automatic regulators or series windings on the main generator fields, according to this company. This has been complex and costly when dealing with the heavy currents used in plating, it is stated.

The Columbia company states that it has met the difficulty by a new separately excited, "compensating" design of generator. While details are lacking, the maker states the new design provides a means of setting voltage for any required drop, for a constant no load to full load voltage, or for increasing voltage on increasing load. The "compensating" effect is said to be pro-

Equipment and Supply Catalogs

Available free to readers on application to manufacturers unless otherwise stated. Please mention this notice.

Industrial Safety. Metropolitan Life Insurance Company, New York. Methods of conducting safety contests.

Sprayers. Paasche Airbrush Company, 1909 Diversey Parkway, Chicago, Ill. F12-32 on heavy material units.

Monel Metal. International Nickel Company, 67 Wall Street, New York. Bulletin T-5, Engineering Properties.

Metallographic Plates. Eastman Kodak Company, Rochester, N. Y. Leaflet on Wratten & Wainwright plates.

Crucibles. Lava Crucible Company of Pittsburgh, Pa. (Wabash Building). Leaflet on new machine manufacturing process.

Electric Heating Units and Devices. General Electric Company, Schenectady, N. Y. GEA-1520A, 36 pages, fully illustrated.

Plating Chemicals. R. & H. Chemicals Department, E. I. du Pont de Nemours and Company, Inc., Wilmington, Del., quarterly price list.

Pewter. National Lead Company, 722 Chestnut Street, St. Louis, Mo. A table of gauges, thicknesses and weights of pewter circles, for handy computation.

First Aid Reminders. National Safety Council, Inc., 20 North Wacker Drive, Chicago, Ill. Very useful booklet for workers. Sample copy free.

Phosphor Bronze. The American Brass Company, Waterbury, Conn. Complete bulletin on physical properties and applications of "Anaconda" phosphor bronze of all grades.

Financial. Metropolitan Life Insurance Company, New York. Descriptive Information in Annual Reports to Stockholders, an interesting booklet for corporation executives.

Testing Apparatus. Adam Hilger, Ltd., 98 King's Road, Camden Road, London, N.W.1, England. Pamphlet on new eyepiece for spectrometer.

Management. Metropolitan Life Insurance Company, New York. Vol. XI, No. 1, Executives Service Bulletin, contains data on taxes, small company management, sales ideas.

The B. F. Goodrich Rubber Company, Akron, Ohio. New publications: "Linerite," a 20-page bulletin on rubber lining for rotary grinding mills; "Highflex Transmission Belt," 8 pages.

Photoelectric Recorder. General Electric Company, Schenectady, N. Y. Instrument for measuring electric current, temperatures, thicknesses, noise intensity, illumination, vibration, etc. Bulletin GEA-1480B.

Zinc Die Casting Alloys. New Jersey Zinc Company, 160 Front Street, New York. Vol. 1, No. 1 of "The Alloy Pot," first of a series of bulletins on zinc die casting information. Free binder for the bulletins is offered.

Markets. The Merchants Association of New York, Woolworth Building, New York. "New York—The World's Greatest Market Place," a 24-page bulletin containing a large amount of information and many very good illustrations of the city today and as it was about 75 years ago.

duced at all voltages within the operating limit of the machine, the "compensator" circuit and generator field circuit being separately adjustable, not affecting functioning of each other. No automatic regulator, relays or heavy series windings are employed, and only a few extra watts of power is needed for the "compensator" circuit, it is claimed.

Light Electric Hammer

A new electric hammer weighing only nine pounds is offered to industry through distributors by The United States Electrical Tool Company, 2462 West 6th street, Cleveland, Ohio. The light weight is made possible by operating the hammer through a special flexible shaft attachment connected with any light type half-inch electric drill. In addition to the large decrease in weight for a hammer of this capacity, it is claimed that the flexible shaft also prolongs the life of the tool by absorbing the destructive jarring otherwise imposed on the power unit.

Specifications claim 4,000 blows per minute up to one inch, finest Swedish steel in the hammer member, and high grade ball and roller bearings throughout. Greater ease of handling is included among the new advantages. It is sold with or without the drill to operate it.

International Exchange of Manufacturing Rights

Amerika-Interessen, Inc., New York, has been formed as the American unit of a concern which has offices in several European capitals, for the purpose of handling international exchange of manufacturing rights, process licenses between patentees in various countries, and similar business. The company states that due to the present state of tariff conditions, many manufacturers both here and abroad are finding difficulty in pursuing business by sale of products, and are finding it profitable to arrange for use of their patents and processes by companies in other countries, who can market the products there.

Amerika-Interessen, Inc., is a unit of A. G. Fuer Amerika-Interessen, operating in Berlin, Paris and London. It states that it has already accomplished considerable work in introducing production and marketing rights of German firms to England, France and vice versa. The American unit has selected about 100 foreign devices for exploitation in this country through sale of rights to American users, and it is hoped to introduce many American products abroad also, according to Botho Lilienthal, president. Many metal products and metal working ideas are included, it is stated.

Personals

James R. Sheldon

James R. Sheldon, who was recently elected president of Beardsley and Wolcott Manufacturing Company, Waterbury, Conn., is one of Connecticut's most influential and widely known industrial leaders. He is president and treasurer of several companies, a director in quite a number, and manager of several.

Mr. Sheldon is a comparatively young

JAMES R. SHELDON

man, having taken the degree of mechanical engineer at Yale in 1916. He then went to work for the Waterbury Clock Company, of which he is today president, treasurer and a director. His first association with that company was from 1917 to 1927, when he formed James R. Sheldon and Company, New York, engineers, and of which he is still president and a director. He became head of Waterbury Clock Company some time ago, when the company was reorganized.

Mr. Sheldon is connected with the following companies not mentioned above: American Mills Company, Waterbury, as general manager; The Ingersoll-Waterbury Company, Waterbury, as president, treasurer and a director; The Brach Time Company, Waterbury, as president, treasurer and a director; Appliance Manufacturing Company, Waterbury, as president and a director; Automatic Machine Company, Bridgeport, as general manager.

C. T. Howard has been appointed treasurer of the New England Lacquer Company, Providence, R. I.

Dr. J. Mitchell Fain, consulting chemist, is now associated with Foster D. Snell, Inc., 130 Clinton Street, Brooklyn, N. Y.

O. B. Wilson, formerly manager of the Cleveland office of The Brown Instrument Company, Philadelphia, Pa., has been appointed district manager of the territory comprising Texas, Louisiana and Southern Arkansas, with headquarters at Houston, Texas.

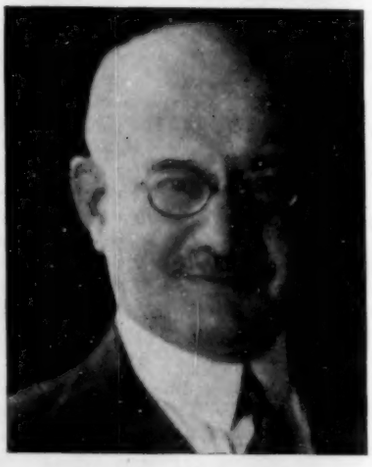
Robert V. Kirk has been elected secretary of the Roxalin Flexible Lacquer Company, Long Island City, N. Y., in recognition of his services. He has been chief chemist of the firm for several years. **M. A. Dorian** has been promoted to chief chemist to take Mr. Kirk's place.

C. E. Piper has resigned as production manager of the Pittsfield, Mass., works of General Electric Company, and purchased an interest in Erie Bronze Company, Erie, Pa., producers of nonferrous castings, bearings, bushings, acid resisting metals, etc. Mr. Piper was with General Electric in various capacities for 29 years.

Obituaries

Milton L. Lissberger

Milton L. Lissberger, president of Marks Lissberger and Son, Inc., Long Island City, N. Y., manufacturers of white metal alloys, solders, etc., died January 22, 1933, of an embolism. He was 66 years old, and had been in the metal business for 47 years. He was prominently identified with numerous companies during his



MILTON L. LISSBERGER

career, and was also known for his progressive action in regard to business in general. He led in a number of tariff fights, and was otherwise of great service to the metal business. He was a charter member of the United States Chamber of Commerce, a member of the New York State Chamber, the Hardware Club of New York, the Detroit Purchasing Agents Association, and numerous non-commercial organizations.

Emmet Birney

Emmet Birney, president and general manager of the Metal Spray Company, Cleveland, Ohio, died suddenly of heart attack on January 15, 1933. Mr. Birney, who was 60 years of age, had just completed an inspection tour of his plant.

Harry B. Dow

Harry B. Dow, assistant secretary of Waterbury Clock Company, died of a heart attack at his home in Waterbury, Conn.,

December 26, 1932. He was 54 years old. He came to the clock concern in 1912 from the Winchester Repeating Arms Company, New Haven.

Mr. Dow was born in New Haven July 31, 1878, the son of Edwin C. and Hester Barnes Dow. His father was judge of the municipal court there and he, himself, for a time studied law. He was traffic manager and purchasing agent of the Winchester concern and went to Waterbury Clock as purchasing agent. He had served as alderman and president of the board of aldermen of the city, and as a member of the board of finance. He was president of the Chamber of Commerce for two years. W. R. B.

Peter C. Fuhrmann

Peter C. Fuhrmann, 76 years old, of Trenton, N. J., died recently at his home after a lengthy illness. He was superintendent of the John A. Roebling's Sons Company for more than fifty years, and about five years ago retired. He is survived by three sons and two daughters. He was a prominent member of the Masonic Fraternity. Burial was in the family plot at Trenton. C. A. L.

Henry T. Cross

Henry T. Cross, treasurer of the Thinsheet Metals Company, Waterbury, Conn., died January 29, 1933, after a heart attack. He was 64 years old.

Mr. Cross, a native of Waterbury, was well known in manufacturing circles. He was formerly superintendent of the Connecticut Brass and Manufacturing Company, and before that had held important positions in the plants of the Waterbury Machine Company and the Farrel Foundry and Machine Company. He was the son of F. E. Cross, a member of Cross and Spiers Machine Company, Waterbury.

John F. Staab

John F. Staab, superintendent of the Edwardsville Brass Works, Edwardsville, Ill., died at the age of 77 on January 23, 1933. He had been ill a short time. Mr. Staab was in the brass industry 64 years.

News of Associations

Institute of Metals Division

In conjunction with the 142nd Meeting of the American Institute of Mining and Metallurgical Engineers, the Institute of Metals Division will meet at Engineering Societies Building, 29 West 39th Street, New York, on Tuesday and Wednesday, February 21 and 22. The whole A.I.M.E. meeting will take four days, February 20-23. The usual dinner of the Institute of Metals will be held Tuesday evening, and E. M. Wise of the International Nickel Company will be principal speaker. His subject will be The Platinum Metals.

Besides the Institute of Metals Division sessions Tuesday and Wednesday, there will be a session on Gases in Metals on Thursday morning, February 23, in which the Division will meet jointly with the Iron and Steel Institute, and continue the symposium on Gases in Metals begun last year. Leaders of assigned subjects will be John Johnston, P. H. Brace, J. L. Christie, E. R. Darby, C. H. Mathewson. Discussion of Gas-metal Problems of the Brass Industry will be led by Mr. Christie, and of Gas-metal Problems of the Nonferrous Foundryman by E. R. Darby. Discussion will be informal and unrecorded.

The Annual Lecture will be delivered Wednesday at 4 P. M., by Dr. Georg Masing, metallurgical lecturer at the Technische Hochschule, Berlin; his subject: Present-Day Problems in Theoretical Metallurgy.

Institute Program—Tuesday Morning

Rate of precipitation of Nickel Silicide and Cobalt Silicide in the Hardenable Copper-nickel-silicon and Copper-cobalt-silicon Alloys. By C. WILSON, H. F. SILLIMAN and E. C. LITTLE.

Precipitation of Alpha from Beta Brass. By O. T. MARZKE.

A Microscopic Study of the Decomposition of the Beta State in the Copper-aluminum System. By C. S. SMITH and W. EARL LINDLIEF.

The Metastable Solid Solution Beta-prime of the Aluminum-copper Alloys. By NICHOLAS AGEEW and GEORGE KURDJUMOW.

An X-ray Study of Cold-worked Brass. By L. THOMASSEN and D. M. MCCUTCHEON.

Tuesday Afternoon

Machinability of Free-cutting Brass Rod, II. By ALAN MORRIS.

Comparative Properties of Oxygen-free, High-conductivity, Phosphorized and Tough-pitch Coppers. By W. R. WEBSTER, J. L. CHRISTIE and R. S. PRATT.

High-conductivity, Oxygen-free Copper. Lecture by SIDNEY ROLLE and P. H. BRACE.

Fabrication and Properties of Seamless Phosphorized Arsenical Copper Tubing. By G. L. CRAIG and O. Z. KLOPSCH.

Occurrence of Irregularities in Lead Cable Sheathing and Their Relation to Failure. By WILLIAM H. BASSETT, JR. and C. J. SNYDER.

Tuesday Evening

The Platinum Metals. By E. M. WISE.

Wednesday Morning

Segregate Structure of the Widmanstätten Type Developed from Solid Solutions of Copper in Zinc. By M. L. FULLER and J. L. RODDA.

Role of the Platinum Metals in Dental Alloys, III—Influence of Platinum and Palladium and Heat Treatment upon the Microstructure and Constitution of Basic Alloys. By E. M. WISE and J. T. EASH.

Diffusion of Hydrogen Through Platinum and Nickel and Through Double Layers of These Metals. By W. R. HAM.

Wednesday Afternoon

Thermal Expansivity of Aluminum Alloys. By L. W. KEMPF.

Equilibrium Relations in Aluminum-chromium Alloys of High Purity. By WILLIAM L. FINK and H. R. FRECHE.

Equilibrium Relations in Aluminum-manganese Alloys of High Purity, II. By E. H. DIX, JR., WILLIAM L. FINK and L. A. WILLEY.

Quantitative Estimation of the Impurities in Tin by Means of the Quartz Spectrograph. By C. STANSFIELD HITCHEN.

Present-day Problems in Theoretical Metallurgy. (Institute of Metals Annual Lecture). By DR. GEORG MASING.

American Society for Testing Materials

Standing committees of the A.S.T.M. will hold their annual spring group meetings from March 6 to 10, inclusive, at the Hotel New Yorker, New Yerk City.

Connecticut Foundrymen

Connecticut Non-Ferrous Foundrymen's Association will meet Monday evening, February 13, at Hotel Garde, New Haven, Conn. There will be the usual dinner at 6.30 P.M., preceding the meeting. Speaker will be O. G. Willey, metallurgist of Jenkins Brothers Company, Bridgeport, Conn., whose subject will be Laboratory Control of the Foundry.

Louis G. Tarantino, 523 West Taft Avenue, Bridgeport, Conn., is chairman of the committee.

Major Meetings in 1933

American Electroplaters' Society, Annual Convention, Congress Hotel, Chicago, Ill., June 27, 28, 29, 30.

American Foundrymen's Association, Annual Convention and Exposition, Stevens Hotel, Chicago, Ill., week of June 19.

The Electrochemical Society, Spring meeting, Hotel Windsor, Montreal, Canada, May 11, 12, 13; Fall meeting, Chicago, Ill., September 7, 8, 9.

American Society for Testing Materials, 1933 Meeting and Second Exhibit of Testing Apparatus, Stevens Hotel, Chicago, Ill., June 26, 27, 28, 29, 30.

Institute of Metals Division, A.I.M.E., Annual Meeting, Engineering Building, 29 West 39th Street, New York, February 20, 21, 22, 23.

British Institute of Metals, 25th Annual General Meeting, London, March 8, 9; General Meeting and Annual May Lecture, London, May 10.

National Metal Congress and Exposition, Detroit. W. H. Eisenman, Secretary, 7016 Euclid Avenue, Cleveland, Ohio, October 2-6.

American Electro-Platers' Society

Executive Committee, 1933 Convention, Chicago

F. H. HANLON
General Chairman

C. S. TOMPKINS
General Secretary

All communications regarding the convention should be addressed to the general secretary, at 6916 Clyde Avenue, Apt. 303, Chicago, Ill.

CHICAGO'S PARK AND BOULEVARD SYSTEMS

Platers, manufacturers and others who visit Chicago next June to attend the American Electroplaters' Society Convention will have an opportunity to see the finest and most extensive system of parks and boulevards of any city in the world. Chicago's parks and boulevards are not controlled by the city government, but are administered under three independent systems: The South Park System; The Lincoln Park System; The West Chicago Parks System. Each has jurisdiction over the parks and boulevards in a specified area.

The South Park Commissioners control the 303-acre Grant Park on Lake Michigan, where there are the Art Institute, Field Museum of Natural History, Soldier Field Stadium, Goodman Theatre, Buckingham Fountain, Shedd Aquarium, Adler's Planetarium, etc.

Jackson Park has 554 acres, including 108 acres of lakes and harbors and 8 miles of driveway, and two golf courses. It contains one of the finest bathing beaches in the country, and Rosenwald Museum of Science and Industry, a superb survival of the 1893 Columbian Exposition.

Midway Plaisance, 660 feet wide, connects Jackson and Washington Parks. On either side is the wonderful campus of the University of Chicago. Washington Park, 371 acres, Marquette Park, 323 acres, and a number of community parks are included.

Boulevards on the South Side are Leif Erikson Drive, South Parkway, Drexel, Michigan, South Shore Drive, Marquette Road ond Midway Plaisance.

Lincoln Park has 701 acres along Lake Michigan, containing the Zoo and many celebrated statues. Lake Shore Drive extends southward from Lincoln Park.

West Chicago Parks Commissioners have Humboldt Park, 206 acres; Garfield Park, 188 acres; Douglas Park, 182 acres; Columbus Park, 144 acres; and Washington, Jackson, Douglas and Humboldt Boulevards under their jurisdiction.

The combined length of Chicago's boulevards is over 170 miles. There are 14 large parks, 193 small parks, 62 athletic fields, 89 playgrounds and 15 bathing beaches, with an aggregate area of 6,500 acres.

Three of the larger parks are on the shore of Lake Michigan. Many miles of beautiful boulevards connect the major parks affording motor routes that quickly give the visitor a conception of the magnitude and varied attractions of the system.

The foregoing facts are meager in detail and do not do justice to the subject, but when you come as our guests next June the boys of Chicago Branch are going to be ready to show you "Chicago as it should be shown".

Take us up on it. Don't forget the dates—June 27, 28, 29 and 30.

We'll be see'in yuh,

1933 CONVENTION COMMITTEE.

Research Fund

Contributions to the Research Fund of the American Electroplaters' Society during January, amounted to $325. The contributors during that period were:

Day-Brite Reflector Co., St. Louis, Mo., $10; Hays Mfg. Co., Erie, Pa., $15; Oscar Servis, Chicago, $10; Taylor Instrument Co's., Rochester, $25; Manufacturers Plating Works, Chicago, $5; Harshaw Chemical Co., Cleveland, $50; T. J. Murray Plating Co., Springfield, Mass., $5; C. W. Yerger, Matawan, N. J., $10; National Zinc Co., New York, $25; American Sterilizer Co., Erie, Pa., $10; Bridgeport Metal Goods Mfg., Co., Bridgeport, $15; Baltimore-Washington Branch, A. E. S., Baltimore, $100; Eagle Plating Co., Worcester, Mass., $5; General Railway Signal Co., Rochester, $10; Worcester Brass & Electro-Plating Co., Worcester, $5; Bell Telephone Laboratories, New York, $25.

Subscriptions may be sent to the Secretary-Treasurer of the Research Fund, Walter Fraine, 507 Grand Avenue, Dayton, Ohio.

RESEARCH COMMITTEE, A.E.S.

New York Branch

Annual educational session and banquet of the New York Branch, A. E. S., will be held Saturday, February 18, at the Aldine Club, 200 Fifth Avenue, New York. Session begins 3:30 P. M.; banquet at 7:00 P. M. Everyone interested in plating and finishing is urged to attend both functions.

Institute of Metals

Albert Portevin, noted French engineer, will deliver the Annual May Lecture of the Institute of Metals of Great Britain, at Westminster, May 10. Subject: Quenching and Tempering Phenomena in Alloys.

Waste Material Dealers

Annual Convention of the National Association of Waste Material Dealers, Inc., Times Bldg., New York, will be held at Sherman Hotel, Chicago, Ill., March 13 to 15 inclusive. The Metal Division will hold a session during the period.

Exhibition of New Materials, Products and Uses

A novel exhibition of New Materials, New Products and New Uses, assembled by the National Alliance of Art and Industry, which is on view till February 15th in the Art Center Building, 65 East 56th Street, New York, has attracted large audiences.

In the metal section copper sheet as thin as paper was shown by American Brass Company; panels of enameled stainless steel by American Sheet and Tin Plate Company; there were also objects in colored aluminum suggesting new uses for this material. Russel Wright studios showed household equipment in aluminum; there were Taylor Instrument Company and Bausch and Lomb products designed by Walter Dorwin Teague.

Among the other exhibitors are New Jersey Zinc Company; International Nickel Company; General Electric; Westinghouse; and many others.

The exhibition is free to the public daily except Sunday between 10 a. m. and 6. p. m.

Electroplaters' Protective and Benevolent League

The United Electroplaters Protective and Benevolent League held a meeting January 14, at New York City, at which new officers were installed. Charles H. Proctor acted as chairman during these proceedings, after which he gave an address in which he reiterated his continued interest in the plating industry and the welfare of the plater. The officers are:

Dennis Kelly, president; Louis Tannert, vice-president; John E. Sterling, secretary; A. M. Kohn, recording secretary; B. Nadel, treasurer; J. Minges, librarian; S. Goldstein, serg.-at-arms; C. Karcher, asst. serg.-at arms. Trustees: F. Krause, H. Karlin, M. Fannon.

The meeting was adjourned after the officers were installed, and a buffet supper was given to the more than 60 members and friends who attended. During the festivities a number of speakers were called upon by President Kelly, including Mr. Proctor, Frank McStoker, Harry Levine, John Rolph, Charles Seigerman, Martin B. Apy, former president of the New York branch of the electrotypers' union, F. Krause, Mr. Stremmel, Louis Tannert and C. Malin.

Correspondence should be directed at Secretary Sterling, 2540 Steinway Street, Astoria, Long Island, N. Y.

Industrial Market Guide

A compilation of basic marketing data especially designed to aid sellers of products consumed in the manufacturing industries to locate their markets more accurately and economically, and to estimate probable demand, is offered to business men of the country in the United States Commerce Department's newest trade publication "Manufacturing Market Statistics." Copies are obtainable at $1.00 each from the Government Printing Office, Washington, D. C., or from District Offices of the Bureau of Foreign and Domestic Commerce in principal cities.

Industrial and Financial News

Cold Metal Process Is Favored in Patent Suit

Cold Metal Process Company, Youngstown, Ohio, plaintiff, is favored in a decision of the United States District Court at Pittsburgh regarding the Steckel four-high roller bearing mill patent No. 1,779,-195. The company brought suit against United Engineering and Foundry Company, Pittsburgh.

The matter involved the well known four-high roller-bearing mill commercially introduced by United Engineering and Foundry Company about 1925. The main feature in controversy was the use of roller bearings on the necks of the backing rolls, by means of which, according to the patent sued on, heating of the roll necks is avoided such as would cause wrinkling or buckling of the strip being rolled at high speed.

Before the bringing of the present suit the parties had been involved in a Patent Office interference, in the course of which they entered into a contract under which the United Company was to receive a license when and if a Steckel patent was issued containing certain claims. The Steckel patent was granted a short time before this suit was filed.

Among the defenses urged by the United Company were that the patent is invalid, and that under the contract previously entered into between the parties, United is entitled to a license if the patent is valid. The court considered these defenses in order, and held (1) that the patent in suit is valid, and (2) that United has a right to a license thereunder. In other words the court decided for Cold Metal as to validity of the patent, and decided for United as to its right to a license under it.

The license which United will get under this holding of the Court is defined in the contract as follows: "* * * Cold Metals shall grant to United a license to make, use and sell rolling mills under such claim or claims, which license shall be exclusive to United for 4-High Hot Mills and for 4-high cold mills, in which the major portion of the power required by a roll stand is supplied to the rolls directly and not through tension exerted on the material for pulling it through the rolls. * * *"

Apparently, therefore, the effect will be that United Engineering and Foundry Company is the only concern that has a right to make, use, or sell the four-high mills covered by the Steckel patent within the exclusive field described in the contract above quoted. That might mean that not even Cold Metal Process Company itself could make, use, or sell the patented mill in that field except with the consent of United.

The existing contract provides that the payment to Cold Metal by United for its license under the Steckel patent in suit is to be fixed by three arbitrators. No steps have yet been taken by the arbitrators to determine the payment to be made.

Reports Increased Sales of Nonferrous Alloys

Considerable improvement in non-ferrous alloy business over a large part of the country is indicated in the report of a sales representative of a major company, who has just completed an extensive selling trip. He reports that his trip this January was the best in two years, the volume of business booked having been almost three times as great as in January, 1932.

General Motors Licensed to Use Bullard-Dunn Process

The Bullard Company, Bridgeport, Conn., has granted General Motors Corporation a license to use the Bullard-Dunn process for electrolytically descaling metal.

This license covers the use of the process in all General Motors' plants, and was executed after an exhaustive practical test of the process in the Cadillac plant at Detroit and in the Research Division of the General Motors Corporation, it is stated.

R. & H. Is New Department of du Pont de Nemours

The business known in the past as the Roessler and Hasslacher Chemical Company, Inc., on January 1, 1933, became the R. & H. Chemicals Department of E. I. du Pont de Nemours and Company, Inc., Wilmington, Del. Ownership of R. & H. by du Pont was effected some time ago. The R. & H. business will be handled from all du Pont branch sales offices, and from headquarters at Wilmington.

Walter L. Abate

The firm of Walter L. Abate, 2085 Clark Avenue, Detroit, Mich., manufacturer of brass goods, screw machine products, etc., is now in charge of Walter M. Abate, son of the late W. L. Abate, who was mechanical editor of METAL INDUSTRY for many years. The firm still specializes in production of hand ground cocks having very exact finish, and is also doing restaurant work such as legs and posts for cases, fixtures, etc. The screw machine department is also a feature of the Abate plant.

Glidden Wins in Lacquer Patent Suit

United States District Court for the Eastern District of New York has handed down a decision in the suit of E. I. du Pont de Nemours and Company, Inc., against The Glidden Company, for alleged infringement of the Flaherty patent, Reissue 16803, which, according to facts brought out during the trial, is the basic patent covering manufacture of Duco. The patent in suit specifically related to use of low-viscosity .nitrocellulose in lacquers. The court held that the Flaherty patent was invalid for lack of invention, work of earlier patentees being held to have anticipated the work of Flaherty.

Another suit for infringement of the patent is being brought by du Pont against the Jones-Dabney Company, Louisville, Ky.

House Building on Mass Production Basis

Universal Homes Company, 806 Architects Building, Los Angeles, Calif., has been organized for the purpose of mass production of dwellings. C. Louis Michod is manager. The company plans to produce houses in a manner similar to automobile production, with financing plans similar to those used in the automotive business.

Brass Ingot Statistics

On January 1, unfilled orders for brass and bronze ingots and billets on the books of the members of the Non-Ferrous Ingot Metal Institute, Chicago, Ill., amounted to a total of 16,373 net tons, as compared with 16,648 tons on December 1, 1932.

The combined deliveries of brass and bronze ingots and billets by the members of the Institute for December, 1932, amounted to 1,492 tons, as compared with 1,646 tons for November, 1932.

Average prices per pound received by the Institute membership on commercial grades of six principal mixtures of ingot brass during the twenty-eight day period ending January 27, 1933, as follows, with which we supply comparative prices reported for the period ended December 30, 1932:

28 Days Ended	Jan. 27	Dec. 30
Commercial 80-10-10 (1% Impurities)	6.087c	6.442c
Commercial 78%	4.520c	4.750c
Commercial 81%	4.847c	4.976c
Commercial 83%	5.176c	5.395c
Commercial 85-5-5-5	5.382c	5.653c
Com. No. 1 yellow	4.054c	4.163c

Brass and Plating Beautify Motor Boats

Nonferrous metals having corrosion resistant properties continue to go into the motor boat and kindred marine lines at a steadily accelerating pace. This was indicated by the 1933 Motor Boat Show at New York last month. There were many evidences of the use of brass, bronze and other copper-base alloys as castings, forgings and rolled or otherwise wrought shapes. Many of the marine engines on display were enhanced in beauty by bright polished brass and plated parts. The American Brass Company had an extensive exhibit, with emphasis on Everdur metal, which has found wide application in boats because of its high resistance to corrosion. The International Nickel Company was another large exhibitor of metals for marine use, including Monel and nickel, both of which are being extensively used on boats. A new Monel use is for propellers. Other exhibitors whose products are familiar to our readers were the Bausch and Lomb Optical Company; Joseph Dixon Crucible Company; Federal Mogul Corporation; L. O. Koven and Brother, Inc.; M. L. Oberdorfer Brass Company; Pyrene Manufacturing Company; Quigley Company; The B. F. Goodrich Rubber Company.

Automobile Show

The National Automobile Show at New York last month received a surprising amount of public interest, and raised the hopes of the industry considerably. The 250 or more new models on display indicated that the makers have gone steadily onward as regards improved design and engineering, and material reduction in prices. This has entailed considerable additions in the way of accessories, which are largely made of nonferrous metals, and many of which require electroplated or other finishes. If the attention given by the public materializes into real business, the metal and finishing industries, especially in the automobile producing centers, will benefit in proportion. It is the opinion in the industry that the potential business is large, having been stored up through lack of car renewal since 1930. Estimates of cars in use which can reasonably be expected to be discarded or turned in are large.

Among developments of interest to the metal and finishing lines are increased application of rustproofing to bodies and accessories; increased use of radiator grilles many of which are of brass or die cast metal, and usually chromium plated; wide use of twin horns and tail lights; use of Dowmetal (aluminum-magnesium alloy) for commercial bodies; automatic device for closing all windows and locking all doors at once, made by Bridgeport Brass Company.

Aluminum Aids Mining

There is a growing tendency to increase the net lifting capacity of mine hoists by decreasing the weight of cages and skips, says a recent issue of "Compressed Air Magazine." In Canada, several mines are using skips made of an aluminum alloy, which permits considerable reduction in weight of carrier without sacrifice in strength. One of these mines has lately installed three such skips each of 4 tons capacity and weighing about 5,100 pounds, or 3,000 pounds less than the regulation steel skip of like carrying capacity. As a result of this change in materials the hoist can lift a far greater net load than heretofore —in fact, the increase is almost in direct proportion to the saving in weight. The physical characteristics of the aluminum used closely approach those of steel but its weight is about 65 per cent less, or 174 pounds as against 490 pounds, the magazine says.

Safety Conference

The Fourth Annual Greater New York Safety Conference will be held March 1 and 2, 1933, at Pennsylvania Hotel, New York, under the auspices of the Metropolitan Chapter of the American Society of Safety Engineers, Engineering Division of the National Safety Council. The scope and excellence of the program which is being arranged and the prominence of the speakers is worthy of the interest of all executives of industry.

Conference headquarters: 9 East 41st Street, New York.

Metal Developments

An interesting new field of industry is the prevention of noise and vibration in industrial plants. Fletcher Waller, research analyst on psychology, told officials of The B. F. Goodrich Rubber Company in Akron, Ohio, "Extensive tests have proved conclusively that noise not only reduces production in industrial plants but also greatly increases the workers' fatigue." Among the materials used to dampen noise are rubber, cork, asbestos and lead.

Business Items—Verified

Baird Machine Company, Bridgeport, Conn., has temporarily deferred construction of a plant addition for which it has plans.

Floyd and Phillips Machine Company, 418 Second Street, Portsmouth, Ohio, will install a brass and aluminum foundry. The following departments are operated: brass, bronze and aluminum foundry; brass machine shop, soldering.

Faith Manufacturing Company, Chicago, Ill., has purchased part of Tallman Brass and Metal Company property at Hamilton, Ont., and organized a Canadian subsidiary to manufacture auto accessories, die castings and to do outside plating and polishing work.

J. A. Fay and Egan Company, Cincinnati, Ohio, manufacturers of woodworking machinery, plan establishment of subsidiary, Fay-Egan Manufacturing Company, to manufacture metal airplane propellers, heretofore a department of the parent concern's business. The following departments are operated: tool room, machine shop, polishing, grinding room, lacquering.

International Selling Corporation, agents for several French producers of aluminum and other metals and minerals, and dealers in ores, metals, chemicals, etc., have become exclusive sales agents for Coignet Chemical Products Company, and have removed to larger quarters at 70 Pine Street, New York City, in the Sixty Wall Tower Building.

Central Metallic Casket Company, 2004 West Lake Street, Chicago, Ill., has purchased a 3-story industrial building at Logan Boulevard and Holly Avenue, and will alter it for use as its new plant, showrooms and offices. Company makes metal caskets, casket hardware, etc. All machinery will be converted to direct motor drive. **E. H. Forke** is president; **P. H. Rapp,** secretary.

Advance Pressure Castings, Inc., 34 North 15th Street, Brooklyn, N. Y., has appointed several representatives for sale of its aluminum, zinc, tin or lead base die castings. They are: F. X. Morris, 448 Irvington Road, Drexel Park, Delaware County, Pa.; L. E. & L. Sales Engineers, 212 Humber Building, Highland Park, Mich.; W. R. McDonough & Co., National Building, Cleveland; B. J. Steelman, 224 South Michigan Avenue, Chicago; and A. C. Werner, 5522 South 37th Street, St. Louis.

Bound Brook Oil-less Bearing Company, Bound Brook, N. J., this year celebrates its 50th anniversary. The firm was incorporated in 1883, and is still owned and operated by Bound Brook people. Principal products are impregnated wood bearings, graphited bronze bearings, and (latest development) bearings made of powdered metals such as copper, tin, lead, zinc, etc. The company has a wholly owned subsidiary, **Fischer Foundry Corporation,** producing bronze and aluminum castings.

Thomson-Gibb Electric Welding Company, Bay City, Mich., announces that its wire machinery department, organized last fall, has been incorporated as **Thomson-Judd Wire Machinery Company,** with plant at Lynn, Mass. A complete line of steel and copper wire drawing machinery will be manufactured, as well as stranders, textile and paper insulating machinery, armoring, saturating, galvanizing, tinning, welding and brazing equipment. Officers of the new subsidiary are: G. A. Cutter, president; Josiah Judd, vice-president and general manager; D. J. Lyne, secretary; A. P. Reed, treasurer; W. T. Ober, assistant secretary. These, with A. R. Petterson, form the board of directors.

News From Metal Industry Correspondents

New England States

Waterbury, Connecticut

FEBRUARY 1, 1933.

James R. Sheldon was re-elected president of **Waterbury Clock Company** at the annual meeting last month. He is a son-in-law of the former president, Irving H. Chase, and with associates recently secured control of the company by putting through a refinancing plan under which he and his associates took a large block of preferred stock. (See page 74.

George R. Close, formerly secretary, was elected treasurer, an office recently held by Mr. Sheldon. **Carl Kraft,** an associate of Mr. Sheldon in the refinancing plan, was elected secretary, and **M. M. Abbott** was elected assistant treasurer.

Waterbury Clock Company has closed its paper box and print shop and will buy boxes and labels from Waterbury Paper Box Company.

C. L. Hollister, treasurer of the American Brass Company, is chairman of the local committee on industrial rehabilitation which is canvassing the factories and other business concerns to induce them to spend now for plant improvement and renovation, new machinery, etc., what they have planned to spend at some time in the future. The theory is that prices are now at such low levels that the money will go further, and that such buying now and hiring of help necessary to put the improvements into effect may start business generally on the up-grade.—W. R. B.

Connecticut Notes

FEBRUARY 1, 1933.

NEW BRITAIN.—Landers, Frary and Clark is now distributing its newest product, the Universal refrigerator.

The same company has started delivery of electric ranges for the Flagg Court Apartments, Brooklyn, N. Y., the initial delivery being 268 ranges. These apartments will be completely electrically equipped.

HARTFORD.—Veeder - Root, Inc., working in conjunction with the **Wayne Company,** Fort Wayne, Ind., has perfected a measuring and computing device to be used on gasoline pumps. It measures the amount of gas pumped and shows the cost to the customer. The cost is computed even when there is a fraction on the cost per gallon as small as 1-10 cent.

Clarence E. Whitney, 63, president, **Whitney Manufacturing Company,** secretary-treasurer of the **Hanson-Whitney Company** and the **Hanson Tap and Gauge Company,** and founder of all these companies, died at his home in Hartford on January 22. He was a director of the **Skayer Ball Bearing Company,** which he recently had moved from Philadelphia.

BRISTOL.—DeWitt Page has retired as general manager of the **New Departure Manufacturing Company,** but will continue as president of the company. **Frederick G. Hughes,** assistant general manager, has been appointed vice-president and general manager. Mr. Page recently returned from a New York hospital where he was operated on. Mr. Hughes came here in 1911 from the Driggs-Seabury Ordnance Corporation, Sharon, Pa. He is considered one of the best engineers in the ball bearing field, and one of the most brilliant engineers in the automotive industry. He has had a long experience in metallurgy, heat treating and production.

MERIDEN.—International Silver Company has closed its branch factory at Derby and transferred its activities to its plants here. The Derby branch, at the time of its closing, employed 125 persons.

BANTAM.—Former plant of **Bantam Ball Bearing Company,** closed the last three years, has been leased to the Antique Wood Products Company of New York. The lease includes an option to buy. Few persons will be employed at the start, but the company expects to employ about 100 within a year.

TORRINGTON.—Hendey Machine Company has elected **David Ayr** president, succeeding **John A. Coe,** now chairman of the board. Mr. Coe, who is president of the American Brass Company, has headed the Hendey company for many years.

Charles Swartout, 67, for many years superintendent of the casting shop of the **American Brass Company,** and an employe of the company for 50 years, died at his home here January 12. He was also treasurer of the **City Oil and Coal Company.** His only survivors are a nephew and a niece.

BRIDGEPORT.—Bridgeport Brass Company, assessed $1,605,021 by the city on its two plants, appealed and secured from the city a compromise assessment of $1,480,021.

DIVIDENDS.—Regular quarterly dividends were paid at the beginning of 1933 as follows: Fafnir Bearing Company, New Britain, 75 cents; North and Judd, New Britain, 25 cents; Hart and Cooley, New Britain, $1.12½; Standard Screw Company, Hartford, 50 cents (and semi-annual preferred of $3); Smyth Manufacturing Company, Hartford, 50 cents; Eagle Lock Company, Terryville, 50 cents; Collins Company, Collinsville, 50 cents. W. R. B.

Providence, Rhode Island

FEBRUARY 1, 1933.

The State has just issued a list of Rhode Island corporations whose charters have been forfeited for non-payment of franchise taxes, including the following connected with the metal trades, giving year of incorporation: **Allen Wrench & Tool Co.,** Providence, 1913; **T. E. Bennett Co.,** Providence, 1901; **Fessenden & Co., Inc.,** Providence, 1905; **The Metals Corporation,** Providence, 1917; **Monat Jewelry Corporation,** Providence, 1926; **Royal Vanity Case Co.,** Providence, 1926; **Vega Jewelry Co.,** Providence, 1926.

Brown & Sharpe Manufacturing Company has reduced capital stock from $16,000,000 to $8,000,000.

Mason Manufacturing Company, Providence, has reduced its capital stock from $150,000 and 10,000 no par common shares, to $110,000.

Imperial-Armour-Rex Company plans a building addition at 14 Blount Street, to be brick, three stories high.

Schwarzkopf & Walker, Inc., manufacturing jewelers, 227 Eddy Street, has changed its name to **Walker Jewelry Company, Inc.**

T. Clyde Foster is president, **John J. King,** vice-president, and **Edward G. Fletcher,** secretary-treasurer, of **King Razor Company,** newly incorporated to manufacture a safety razor invented by Mr. King.

Superior Court confirmed the report of W. C. S. Mays as receiver of the **J. P. Benjamin Pen Company.**

New England Manufacturing Jewelers and Silversmiths' Association will hold its forty-fifth annual reception and banquet the latter part of February. The arrangement committee includes: Chairman William Gow, Harold Andrews, Earl H. Ashley, Dean Baker, Frank Budlong, Edmund H. Cummings, Max Kestenman, William G. Lind, Willard A. Ormsbee, Sturgis C. Rise, G. Leon Silverman, Samuel M. Stone, Jr., Vincent Sorrentino, and Joseph H. Lancor.

Goldstein-Poland Company, Inc., has incorporated as a jewelry manufacturing concern; incorporators are: James J. Poland, Jules P. Goldstein and Virginia A. McGee.

B & R Manufacturing Company, manufacturing jewelers, 36 Broadway, has changed its capital from $12,500 to 100 shares of common stock of no par value.

Helen Grand of 857 South 17th street, Newark, N. J., **Florence Lipnick** and **Tillie Salong** are incorporators of **Eastern Jewelry Manufacturing Company, Inc.,** to be located in Providence.

W. H. M.

Middle Atlantic States

Newark, New Jersey

FEBRUARY 1, 1933.

Merck and Company, Rahway, N. J., on March 1 will dedicate a new chemical research laboratory, said to be the largest of its kind in the country.

Metal Cone Manufacturing Company, 124 Myrtle Avenue, Jersey City, has made plans to alter a two story brick building to cost $40,000.

Titanium Pigment Company, 60 John Street, New York City, will erect two manufacturing buildings, warehouse, machine shop, office and welfare building to cost $1,000,000.

Following Newark concerns have been incorporated: **Volco Wire Company, Inc.,** 100 shares no par; to manufacture copper wire; David Costa, Brooklyn, is one of the officials. **Club Razor and Blade Manufacturing Corporation;** 500 shares no par; manufacture razor blades and cutlery.—C. A. L.

Trenton, New Jersey

FEBRUARY 1. 1933.

John A. Roebling's Sons Company has received a contract from the Navy Department to supply cables for aircraft.

Keystone Aircraft Corporation, Bristol, Pa., has received a government order for planes to cost $228,012. The company manufactures its metal parts at the Bristol factory.

Following concerns have been incorporated here: **Rale Electrical Supply Company, Inc.;** electrical appliances; Asbury Park. **Nop Laboratories, Inc.;** steel and brass; $50,000; Harrison. **Dilco Lamp Works, Inc.;** $125,000; radio tubes; Jersey City. C. A. L.

Central New York

FEBRUARY 1, 1933.

Lack of employment in this area is due to industrial abuses, according to **Dr. H. A. Wilkins,** research director, **Revere Copper and Brass Company,** Rome. Dr. Wilkins has just completed a survey of employment conditions.

He believes it will not be technological improvement or increased scientific knowledge that will cause economic distress in the future but "its unwise application."

"If in the whole breadth of human experience," he said, "technological developments have been of advantage to us, why should we believe that in the future such developments are going to turn about and destroy our present civilization?"

The present method of distributing the country's basic economic wealth is what has broken down the economic system according to the Rome research director. He added that "fair distribution of economic goods is built up on the hypothesis that capital be usefully employed," and that "if our industrial and financial leaders will develop the same degree of specialized knowledge in their fields that the engineer has in his, then we may have a more skillfully ordered economic picture. If this is brought about periods of industrial stagnation and economic distress may properly become fewer and less severe."

Bradford H. Divine of **Divine Brothers Company,** buff manufacturers, is handling the finances for the district Rotary Convention, which will attract 1,000 Rotarians to Utica, April 23, 24, and 25.

Oneida Community, Ltd., Sherrill, N. Y., announced at a meeting of all employes that a 15 per cent cut in wages would go into effect February 1. Persons on salaries would receive the same cut, officials said. When asked about hours of labor a representative of the plant said prospects for late winter and spring were quite as favorable as last spring.

Remington Arms Company, Ilion, N. Y., as an expression of the appreciation of long, faithful service, presented former works manager, **John E. Brennan,** with a gold mounted Model 31 shotgun of the "Over and Under" design. E. K. B.

Middle Western States

Detroit, Michigan

FEBRUARY 1, 1933.

Strenuous efforts have been made to bring life to the automobile industry. Most plants are in production in one way or another. Manufacturers of accessories have been fairly active for the last few weeks, and as the spring season advances their output should increase. Most plants that cater to the motor car trade are operating. How long this will continue remains to be seen.

Otherwise there is not much promise, except perhaps the refrigeration industry, which has been more or less active for a long time. But even this could stand a substantial increase.

The plating plants, particularly those engaged in automobile work, are beginning to show more activity, but there still are plenty that are not doing very much.

Mueller Brass Company, Port Huron, will take over **Sky Specialties Corporation,** Detroit, according to **Fred L. Riggin,** executive secretary of Mueller. It has not been determined yet whether the Sky plant will be moved to Port Huron. Mueller makes steam fittings and parts for various products. Sky Specialties, among other interests, holds basic patents on airplane engine starters.

Charles B. Bohn, head of **Bohn Aluminum and Brass Corporation,** celebrated his fifty-third birthday on January 20. He was born in Toledo, O., in 1880. At 18 he went to work in a brass foundry. He showed considerable inventive genius, and later became interested in aluminum casting. He believed aluminum could be used in the automobile industry back in the early days when other manufacturers had given up the idea, and continued to experiment, until today aluminum is a standard material in the manufacture of motor cars.

Orders have increased to such an extent that **Homer Furnace and Foundry Company,** Coldwater, Mich., will operate five days a week and add employes. For a year the company has been operating two days a week with a skeleton force. It is producing extensively for the automobile industry.

Dow Chemical Company, Midland, Mich., recently completed construction of a Dowmetal trailer weighing only a little more than half as much as comparable conventional vehicles. It is 20 feet shorter than the trailer built by the company a year ago. It weighs 4,400 pounds as compared with its nearest competitor's weight of 7,600 pounds.

Kalamazoo Stove Company, Kalamazoo, Mich., reports selling more ranges in 1932 than in 1931. Range sales were about two-thirds of the business, it is stated.

Schwarze Electric Company, Adrian, Mich., recently closed three contracts with automobile manufacturers, and this business together with some new products the organization has had under development, promises full-time operation of the factory for some weeks to come, according to **Harry M. Beery,** treasurer and general manager F. J. H.

Toledo, Ohio

FEBRUARY 1, 1933.

Industrial activity remained slow last month, but conditions have become more encouraging. Manufacturers of automobile parts have been the first to show increased production, and it is possible this may be prolonged until early spring. Toledo has for a long time been laboring under handicaps, but it looks now as if the manufacturers were gradually getting on top of their troubles.

Willys-Overland Company now has 6,300 workers on its payroll and is increasing production steadily on its 1933 line of cars. This compares with 4,100 workers five weeks ago. F. J. H.

Chicago, Illinois

FEBRUARY 1, 1933.

International Harvester Company plans new equipment installations to cost $1,100,000, and the **Allis-Chalmers Manufacturing Company,** Milwaukee, will spend $203,305 for improvements.

Willys-Overland is shipping about 100 trucks daily to **International Harvester Company** under the recent contract signed by the two companies. International is stocking its 300 sales outlets with the new trucks in preparation for public showings.

Elgin Watch Company anticipates increased volume of business as a result of its new Elgin Adventurers' Club contest tied up with the Floyd Gibbons broadcasts. Medallions will be awarded each contestant and each winner will receive an Elgin watch.

Grigsby-Grunow Company began the 1933 refrigerator season with four times as many unfilled orders as at any similar period in the past. The total number of employees recalled to the refrigeration divisions during January was expected to reach 2,000.

Aluminum Train Company, 6319 Kenwood Avenue, has been formed to manufacture toy trains.

Otis Elevator Company has been awarded the contract for elevators in the new Oak Park postoffice.

One of the January guide-lectures at the Field Museum of Natural History was on "Primitive Metal Workers."

The $30,000,000 patent infringement suit of Grigsby-Grunow Company against Radio Corporation of America, General Electric, and Westinghouse was dismissed in the Kansas City, Mo., courts. It was stated an amicable settlement between the parties had been reached and dismissal of proceedings agreed upon.

Burpee Can Sealer Company will have a demonstration at A Century of Progress Exposition showing methods of canning in tin containers and the use of a safe pressure cooker for various culinary operations.

Elgin Stove and Oven Company, Elgin, Ill., has applied for the installation of metal kitchen cabinets in the General Electric kitchen which will be built in the Common Brick House in the Home and Industrial Arts group of the Century of Progress Exposition.

Members of the metal industry who visit the Exposition will be interested in the 28,000 golden shingles which form the roof of the replica of the golden pavilion of Jehol, a Chinese Lama temple. In constructing the double deck roof it was discovered that no one knew how to make gold shingles, and a month of experimentation was required. The result is a new type of shingle made of a copper base. Each copper shingle was treated with six acid baths to remove impurities and then coated successively with red lead, white lead, and yellow lead paint—in order to show through any tear in the gold leaf surface. Approximately 9,000 square feet of pure gold leaf was beaten to cover the shingles. R. G. K.

Pacific States

FEBRUARY 1, 1933.

Standard Oil Company of California has perfected "Calol," a cutting gas for the metal industries. It is liquefied petroleum gas, and is said to make a very clean cut in burning metals.

Willys-Overland is considering enlargement of the plant at 6201 Randolph Street, Los Angeles.

Charles W. Towt has organized **Frost Protector Company,** Lindsay, Calif., to manufacture a device to protect orange groves from frost.

Byron Jackson Company, Berkeley, Calif., has spent $200,000 for plant improvements.

California Wire Cloth Company, San Francisco, plans modernization to cost about $450,000. Included in the plan is an electric galvanizing plant and a new screen layout.

Herman Bray Company, Oakland, Calif., will spend $25,000 on research work in development of stoves, ranges, etc.

Joseph Eastwood, president of **American Forge Company,** San Francisco, reports operations at 50 per cent of capacity.

Pacific Coast Record Corporation, 1040 Geary Street, San Francisco, has set up a plant to make various kinds of recording machines and organs.

State Aluminum and Bronze Company, 741 Gilman Street, Berkeley, Calif., will make a new line of nonferrous castings, including ornamental and electric heater work.

East Oakland Aluminum Foundry has started business at 901 72nd Street, Oakland. **Clarence McDaniel** is head.

Waitsburg Welding Shop, Waitsburg, Wash., has enlarged its facilities.

American Brake Shoe Company, 74 New Montgomery Street, San Francisco, plans construction of a $50,000 foundry at San Bruno, Calif.

John E. Roebling's Sons Company will build a $350,000 wire and cable plant at San Francisco.

E. I. du Pont de Nemours & Company has opened Pacific Coast headquarters at 661 Third Street, San Francisco, and will have a large warehouse. W. J. Sahlinger is in charge.

Pacific Can Company, San Francisco, will spend $90,000 on new plant additions and equipment.

Western Can Company, San Francisco, will spend up to $100,000 for new machinery to make cans for M. J. B. Coffee Company.

Tea Garden Products Company has installed copper kettles to prevent corrosion by fumes of fruit it prepares. Kettles have exhaust hoods and fans.

Lasco Brake Products Company, 26th and Magnolia Streets, Oakland, will spend $75,000 for plant improvements, machinery, etc.

United Light and Shade Company, 980 Harvard Street, San Francisco, had a fire loss of $10,000 recently. Probably will rebuild.

Bender Manufacturing Company, 952 Folsom Street, San Francisco, has been organized by E. A. Bender, to manufacture fire alarm systems, mineral prospecting devices, etc.

Continental Can Company, San Jose, Calif., has put $20,000 worth of new equipment in, and will build a new can plant to cost $110,000 at Oakland.

H. S.

Metal Market Review

Copper

FEBRUARY 1, 1933.

The copper market maintained a firm basis of 5.125c per pound practically throughout the month, which, of course, was no great feat considering that this is an extremely low level for the metal, and below the production costs of almost every producer. More to be expected would have been an advance, but the failure of any concerted buying movement to develop undoubtedly made that impossible. It is fairly well agreed in trade circles that without either a real resumption in business or a real agreement among producers to control production and keep down surplus stocks, the metal will not go up in price.

The industry is reported to be seeking legislation to relieve it from certain restrictions now imposed by the anti-trust laws. In view of general conditions, and considering the length of time it has taken producers to get together in the past regarding production, there does not seem to be any serious danger of a sudden jump in the price. This does not imply, however, that 5 cent copper is anything but cheap.

Automobile production has been increased with the advent of 1933 models, and will consume some metal. Some users of metal in the automotive as well as other lines have shown interest in second quarter metal.

Zinc

Zinc declined to 3.00c East St. Louis about the middle of the month, and at the end had broken through to 2.85c, due, it was said, to fear of statistics showing a further gain in the surplus stocks. At the end of December the stocks stood at over 124,700 tons, a gain of about 3,000 over the end of November figure. A further increase at the end of January would thus be almost certain to cause some sellers to liquidate. It is the belief in some quarters that if demand for tonnages of metal develops, the price will promptly strengthen, the tendency in the zinc business being that way. With building construction still restricted and general manufacturing operations where they are, it is difficult to see whence this tonnage business is ex-

pected to come. Perhaps the automobile industry will manage to absorb some metal, but it is doubtful that it will take enough to materially change the very low price at which zinc is selling today.

Tin

The price of tin fluctuated considerably but tended to rise throughout January, due to foreign influences, chief of which was improvement in sterling exchange. At the end of the month it was at 23.45c, or about 1.00c above the level of January 2. There has been no extraordinary demand for the metal, and none is in sight at this time. A slight increase in tin plate operations in the steel industry gave sellers some encouragement, but the business in general remains very restricted.

Lead

Lead remained unchanged at 2.87½c East St. Louis throughout the month. There was no unusual buying movement, nor was there any further marked reduction in consumer buying. Most of the metal has been going to manufacturers of batteries, with ammunition makers also taking some.

Statistics for 1932 issued by the American Bureau of Metal Statistics showed that 23,765 short tons of lead went to industrial users in December, 1932, as against 22,838 tons in November; and for the whole of 1932, 307,948 tons, as against 429,949 tons in 1931.

Aluminum and Antimony

No material change took place in aluminum last month. The base price remained at 23.30c for Alcoa commercial and mill ingot. Some comment of interest will be found in the section on wrought metals.

The antimony price fluctuated between 5.50c and 5.90c through the month. No important business has been noted, although stocks in bonded warehouses in December were somewhat decreased.

Platinum, Silver, Quicksilver

After holding at $28 for some time, platinum declined to the very low level of $22 per Troy ounce the latter part of January. Sales at even lower levels were rumored. The $22 price is very near the all time low of $18 which was touched in 1908, and the next lowest, $20, which was touched in May, 1931.

Silver strengthened somewhat during January, reaching 26.25c at one time, and the average daily price of 25.43c for the month was somewhat higher than the December average. Aside from speculative business no very large transactions are reported.

Quicksilver held throughout the month at $48 to $49 per flask of 76 pounds.

Old and Scrap Metals

There was a fairly steady tone to the scrap market last month, the list of prices remaining practically unchanged except for minor fluctuations. At the end of the month the general list showed no material changes as compared with the end of December. (Scrap quotations on next page.)

The Wrought Metal Market

FEBRUARY 1, 1933.

January witnessed no material change in the wrought nonferrous metal business. The leading producers of the copper-base fabricated materials established a list of lower prices on January 2, which was maintained throughout the month in consonance with the unchanged price of approximately 5 cents per pound for copper. No changes occurred in lead, zinc, aluminum or nickel base materials. (Complete lists will be found on the opposite page.)

As reported elsewhere in this issue, the past month saw two major exhibitions of products in which nonferrous metals are very important factors—motor boats and automobiles. The shows at New York were well attended and promised some increase in business. In this connection it is of interest that the new Ford model for 1933 is reported to require about 45 pounds of aluminum, and that a similar amount is being used in three other makes of car. Increasing use of some nonferrous metals in boats is due in large part to the need for corrosion resistance in damp and salt atmosphere.

While there has been no material upturn in the metal business (or any other line, as far as we can discern), the trade continues to maintain a hopeful attitude.

A sales representative of one major metal and casting alloy manufacturer reported his January trip, covering many important consuming centers, was the best since 1930 in volume of business booked.

Daily Metal Prices for January, 1933

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	2*	3	4	5	6	9	10	11	12	13	16	17	18
Copper c/lb. Duty 4c/lb.													
Lake (Del.)	...	5.125	5.125	5.125	5.125	5.125	5.125	5.125	5.125	5.125	5.125	5.125	5.125
Electrolytic (Conn.)	...	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Casting (f.o.b. ref.)	...	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75
Zinc (f.o.b. St. L.) c/lb. Duty 1⅛c/lb.													
Prime Western	...	3.125	3.125	3.10	3.10	3.10	3.10	3.10	3.10	3.05	3.00	3.00	3.00
Brass Special	...	3.175	3.175	3.15	3.15	3.15	3.15	3.15	3.15	3.10	3.05	3.05	3.05
Tin (f.o.b. N. Y.) c/lb. Duty Free													
Straits	...	22.50	21.80	22.30	22.375	22.50	22.65	22.95	22.85	22.50	22.375	22.70	22.625
Pig 99%	...	21.25	20.55	21.125	21.20	21.30	21.40	21.75	21.625	21.30	21.20	21.50	21.45
Lead (f.o.b. St. L.) c/lb. Duty 2½c/lb.	...	2.875	2.875	2.875	2.875	2.875	2.875	2.875	2.875	2.875	2.875	2.875	2.875
Aluminum c/lb. Duty 4c/lb.	...	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30
Nickel c/lb. Duty 3c/lb.													
Electrolytic 99.9%	...	35	35	35	35	35	35	35	35	35	35	35	35
Shot (from remelted electrolytic)	..	36	36	36	36	36	36	36	36	36	36	36	36
Pellets 99.5-100%	...	40	40	40	40	40	40	40	40	40	40	40	40
Antimony (Ch. 99%) c/lb. Duty 2c/lb.	...	5.50	5.50	5.50	5.50	5.50	5.50	5.80	5.80	5.80	5.70	5.80	5.80
Silver c/oz. Troy Duty Free	...	24.50	24.875	25.375	25.00	25.25	25.50	25.375	25.25	25.125	25.375	25.25	25.50
Platinum $/oz. Troy Duty Free	...	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	25.00	25.00	25.00	25.00

	19	20	23	24	25	26	27	30	31	High	Low	Aver.
Copper c/lb. Duty 4c/lb.												
Lake (Del.)	5.125	5.125	5.125	5.125	5.125	5.125	5.125	5.125	5.00	5.125	5.00	5.119
Electrolytic (Conn.)	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Casting (f.o.b. ref.)	4.75	4.75	4.75	4.75	4.75	4.75	475	4.75	4.75	4.75	4.75	4.75
Zinc (f.o.b. St. L.) c/lb. Duty 1⅛c/lb.												
Prime Western	3.00	3.00	3.00	3.00	2.95	2.95	2.95	2.90	2.85	3.125	2.85	3.024
Brass Special	3.05	3.05	3.05	3.05	3.00	3.00	3.00	2.95	2.90	3.175	2.90	3.074
Tin (f.o.b. N. Y.) c/lb. Duty Free												
Straits	22.40	22.625	22.80	23.00	23.15	23.10	22.95	23.10	23.45	23.45	21.80	22.70
Pig 99%	21.20	21.45	21.65	21.85	22.00	21.95	21.80	21.95	22.30	22.30	20.55	21.514
Lead (f.o.b. St. L.) c/lb. Duty 2½c/lb.												
Aluminum c/lb. Duty 4c/lb.	2.875	2.875	2.875	2.875	2.875	2.875	2.875	2.875	2.875	2.875	2.875	2.875
Nickel c/lb. Duty 3c/lb.	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30
Electrolytic 99.9%	35	35	35	35	35	35	35	35	35	35	35	35
Shot (from remelted electrolytic)	36	36	36	36	36	36	36	36	36	36	36	36
Pellets 99.5-100%	40	40	40	40	40	40	40	40	40	40	40	40
Antimony (Ch. 99%) c/lb. Duty 2c/lb.	5.80	5.80	5.80	5.90	5.90	5.90	5.90	5.90	5.80	5.90	5.50	5.733
Silver c/oz. Troy Duty Free	25.375	25.375	25.625	26.25	26.00	25.75	25.50	26.00	25.875	26.25	24.50	25.435
Platinum $/oz. Troy Duty Free	25.00	25.00	25.00	25.00	25.00	25.00	25.00	22.00	22.00	28.00	22.00	25.827

*Holiday.

Metal Prices, February 6, 1933

(Import duties and taxes under U. S. Tariff Act of 1930, and Revenue Act of 1932)

NEW METALS

Copper: Lake, 5.00. Electrolytic, 5.00. Casting, 4.75.
Zinc: Prime Western, 2.80. Brass Special, 2.85.
Tin: Straits, 23.75. Pig, 99%, 21.40.
Lead: 2.875. Aluminum, 23.30. Antimony, 5.75.
Nickel: Ingot, 35. Shot, 36. Elec., 35. **Pellets, 40.**
Quicksilver: Flask, 75 lbs., $49. **Bismuth,** 85.
Cadmium, 55. **Silver,** Troy oz., official price, N. Y., February 7, 25.50.
Gold: oz., Troy, $20.67. **Platinum,** oz., Troy, $22.

Duties: Copper, 4c. lb.; zinc, 1¼c. lb.; tin, free; lead, 2½c. lb.; aluminum, 4c. lb.; antimony, 2c. lb.; nickel, 3c. lb.; quicksilver, 25c. lb.; bismuth, 7½%; cadmium, 15c. lb.; cobalt, free; silver, free; gold, free; platinum, free.

INGOT METALS AND ALLOYS

	Cents lb.	U. S. Duty	Import Tax*
Brass Ingots, Yellow	4 to 5¾	None	4c. lb.[1]
Brass Ingots, Red	5¼ to 7½	do	do
Bronze Ingots	6 to10	do	do
Aluminum Casting Alloys	8 to22½	4c. lb.	None
Manganese Bronze Castings	16 to30	45% a. v.	3c. lb.[2]
Manganese Bronze Forgings	22 to33	do	do
Manganese Bronze Ingots	6 to10	do	4c. lb.[1]
Manganese Copper, 30%	15 to22½	25% a. v.	3c. lb.[2]
Monel Metal Shot or Blocks	.. 28	do	None
Phosphor Bronze Ingots	6½to10	None	4c. lb.[1]
Phosphor Copper, guaranteed 15%	9½to15	3c. lb.[2]	do
Phosphor Copper, guaranteed 10%	9 to14	do	do
Phosphor Tin, no guarantee	30 to45	None	None
Silicon Copper, 10%	18 to30	45% a. v.	4c. lb.[1]
Iridium Platinum, 5%	$25.00	None	None
Iridium Platinum, 10%	$26.00	None	None

*Duty is under U. S. Tariff Act of 1930; tax under Section 60 (7) of Revenue Act of 1932.
[1]On copper content. [2]On total weight. "a. v." means ad valorem.

OLD METALS

Dealers' buying prices, wholesale quantities:	Cents lb.	Duty	U. S. Import Tax
Heavy copper and wire, mixed	3¼to 3½	Free	4c. per pound on copper content.
Light copper	2¾to 3	Free	
Heavy yellow brass	1⅝to 1⅞	Free	
Light brass	1¼to 1½	Free	
No. 1 composition	2⅛to 2¾	Free	
Composition turnings	2⅜to 2½	Free	
Heavy soft lead	2⅛to 2¼	2⅛c. lb.	None.
Old zinc	1⅛to 1¼	1½c. lb.	
New zinc clips	1½to 1¾	1½c. lb.	
Aluminum clips (new, soft)	10¼to11¼	4c. lb.	
Scrap aluminum, cast, mixed	3¾to 4	4c. lb.	
Scrap aluminum, sheet (old)	8 to 8½	4c. lb.	
No. 1 pewter	12½to13½	Free	
Electrotype or stereotype	1¾to 2	2⅛c. lb.*	
Nickel anodes	22 to24	10%	
Nickel clips and turnings	17 to25	10%	
Monel scrap	5½to 9½	10% a. v.	

* On lead content.

Wrought Metals and Alloys

The following are net BASE PRICES per pound, to which must be added extras for size, shape, small quantity, packing, etc., as shown in manufacturers' price lists, effective January 2, 1933.

COPPER MATERIAL

	Net base per lb.	Duty*
Sheet, hot rolled	13⅝c.	2½c. lb.
Bare wire, soft	8c.	25% a. v.
Seamless tubing	12⅜c.	7c. lb.
Soldering coppers	14¾c.	45% a. v.

*Each of the above subject to import tax of 4c. lb. under Revenue Act of 1932, in addition to duty.

BRASS AND BRONZE MATERIAL

Net base prices per pound, mill shipments.

	High Brass	Low Brass	Bronze	Duty	
Sheet	11c.	12⅛c.	12½c.	4c. lb.	U. S. Import Tax 4c. lb. on copper content
Wire	11c.	12⅛c.	12½c.	25%	
Rod	8½c.	11⅞c.	12¼c.	4c. lb.	
Angles, channels	19c.		20½c.	12c. lb.	
Seamless tubing	13¼c.		14¾c.	8c. lb.	
Open seam tubing	19c.		20½c.	25%a.v.	No tax.

NICKEL SILVER

Net base prices per lb. (Duty 30% ad valorem.)

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	19⅝c.	10% Quality	22½c.
15% Quality	21¾c.	15% Quality	26⅞c.
18% Quality	23c.	18% Quality	30⅛c.

TOBIN BRONZE AND MUNTZ METAL

(Duty 4c. lb.; import tax 4c. lb. on copper content.)

Net base prices per pound.	
Tobin Bronze Rod	12¼c.
Muntz or Yellow Metal Sheathing (14"x18")	13⅛c.
Muntz or Yellow Rectangular sheet other sheathing	13⅛c.
Muntz or Yellow Metal Rod	9½c.

ALUMINUM SHEET AND COIL

(Duty 7c. per lb.)

Aluminum sheet, 18 ga., base, ton lots, per lb.	32.30
Aluminum coils, 24 ga., base price	30.00

ROLLED NICKEL SHEET AND ROD

(Duty 25% ad valorem, plus 10% if cold worked.)

Net Base Prices

Cold Drawn Rods	50c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Full Finished Sheet	52c.

MONEL METAL SHEET AND ROD

(Duty 25% ad valorem, plus 10% if cold worked.)

Hot Rolled Rods (base)	35	Full Finished Sheets (base)	42
Cold Drawn Rods (base)	40	Cold Rolled Sheets (base)	50

SILVER SHEET

Rolled sterling silver (February 7) 28.75c. per Troy oz. upward according to quantity. (Duty, 65% ad valorem.)

ZINC AND LEAD SHEET

	Cents per lb. Net Base	Duty
Zinc sheet, carload lots, standard sizes and gauges, at mill, less 7 per cent discount	9.00	2c. lb.
Zinc sheet, full casks (jobbers' price)	9.25	2c. lb.
Zinc sheet, open casks (jobbers' price)	10.00to10.25	2c. lb.
Full Lead Sheet (base price)	6.50	2⅜c. lb.
Cut Lead Sheet (base price)	6.75	2⅜c. lb.

BLOCK TIN, PEWTER AND BRITANNIA SHEET

(Duty free)

This list applies to either block tin or No. 1 Britannia Metal Sheet, No. 23 B. & S. Gauge, 18 inches wide or less; prices are all f. o. b. mill:

500 lbs. or over	15c. above N. Y. pig tin price
100 to 500 lbs.	17c. above N. Y. pig tin price
Up to 100 lbs.	25c. above N. Y. pig tin price

Lighter gauges command "extras" over the above prices.

Supply Prices, February 6, 1933

ANODES

Copper: Cast ..... 13½c. per lb.
Rolled, sheets, trimmed ..... 12¼c. per lb.
Rolled, oval ..... 11¾c. per lb.
Brass: Cast ..... 12¾c. per lb.
Zinc: Cast ..... 8½c. per lb.

Nickel: 90-92% ..... 42c. to 46c. per lb.
95-97% ..... 43c. to 47c. per lb.
99% cast, 45c. to 49c.; rolled, depolarized, 46c. to 50c.
Silver: Rolled silver anodes .999 fine were quoted February 7 from 28.75c., per Troy ounce upward, depending upon quantity.

WHITE SPANISH FELT POLISHING WHEELS

Diameter	Thickness	Under 50 lbs.	50 to 100 lbs.	Over 100 lbs.
10-12-14 & 16	1" to 2"	$2.85/lb.	$2.55/lb.	$2.35/lb.
10-12-14 & 16	2 to 3½	2.75	2.45	2.25
6-8 & over 16	1 to 2	2.95	2.65	2.45
6-8 & over 16	2 to 3½	2.90	2.60	2.35
6 to 24	Under ½	4.15	3.85	3.65
6 to 24	½ to 1	3.85	3.55	3.35
6 to 24	Over 3½	3.25	2.95	2.75

Any Quantity

4 to 6	Under ½, $4.90	½-1, $4.75	1 to 3, $4.65
1½ to 4	" 5.45	" 5.30	" 5.25
1 to ½	" 5.75	" 5.60	" 5.50

Extras: 25c. per lb. on wheels, 1 to 6 in. diam., over 3 in. thick.
On grey Mexican wheels deduct 10c. per lb. from above prices.

COTTON BUFFS

Full disc open buffs, per 100 sections when purchased in lots of 100 or less:

11" 20 ply 64/68 Unbleached	$14.49 to 16.60
14" 20 ply 64/68 Unbleached	24.28 to 27.40
11" 20 ply 80/92 Unbleached	16.61 to 18.70
14" 20 ply 80/92 Unbleached	27.83 to 31.10
11" 20 ply 84/92 Unbleached	20.33 to 25.05
14" 20 ply 84/92 Unbleached	34.04 to 41.95
Sewed Pieced Buffs, per lb., bleached	30c. to 70c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.08-.09½
Acid—Boric (Boracic) granular, 99½+% ton lots	lb.	.04½-.05
Chromic, 75 to 400 lb. drums	lb.	.12-.17½
Hydrochloric (Muriatic) Tech., 20 deg., carboys	lb.	.02
Hydrochloric, C. P., 20 deg., carboys	lb.	.06
Hydrofluoric, 30%, bbls.	lb.	.08-.12
Nitric, 36 deg., carboys	lb.	.06-.06½
Nitric, 42 deg., carboys	lb.	.07-.08
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl	lb.	.10½-.12
Denatured drums	gal.	.475-.476
Alum—Lump, barrels	lb.	.03¼-.04
Powdered, barrels	lb.	.03½-.05
Ammonia, aqua, com'l., 26 deg., drums, carboys	lb.	.02¾-.05
Ammonium—Sulphate, tech., bbls.	lb.	.03½-.05
Sulphocyanide, technical crystals	lb.	.28-.37
Arsenic, white, kegs	lb.	.04½-.05
Asphaltum	lb.	.35
Benzol, pure	gal.	.58
Borax, granular, 99½+%, ton lots	lb.	.02¼-.02¾
Cadmium oxide, 50 to 1,000 lbs.	lb.	.55
Calcium Carbonate (Precipitated Chalk)	lb.	.05¾-.07½
Carbon Bisulphide, drums	lb.	.05½-.12
Chrome Green, bbls.	lb.	.19
Chromic Sulphate	lb.	.30-.40
Copper—Acetate (Verdigris)	lb.	.20
Carbonate, bbls.	lb.	.14-.20
Cyanide (100 lb. kgs.)	lb.	.39
Sulphate, bbls.	lb.	2.75-5.25
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.20¼-.20½
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluorspar, bags	lb.	.04½
Gold Chloride	oz.	$12.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.32-.34
Iron Sulphate (Copperas), bbls.	lb.	.01½
Lacquer Solvents	gal.	.85
Lead—Acetate (Sugar of Lead)	lb.	.09-.13
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Methanol, 100% synth., drums	gal.	.41½
Nickel—Carbonate, dry, bbls.	lb.	.32
Chloride, bbls.	lb.	.16-.21
Salts, single, 300 lb. bbls.	lb.	.11-.13
Salts, double, 425 lb. bbls.	lb.	.11-.13
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash Caustic Electrolytic 88-92% broken, drums	lb.	.06¾-.08½
Potassium—Bichromate, casks (crystals)	lb.	.08
Carbonate, 96-98%	lb.	.06⅝
Cyanide, 165 lbs. cases, 94-96%	lb.	.50
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge—Nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in bbls.	lb.	.05-.05½
Silver—Chloride, dry, 100 oz. lots	oz.	.23-.27½
Cyanide (fluctuating)	oz.	.30-.36
Nitrate, 100 ounce lots	oz.	.20-.23¾
Soda Ash, 58%, bbls.	lb.	.023
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.16½-.22
Beryllium fluoride ($2NaF.BeF_2$)	lb.	4.30-7.00
Hyposulphite, kegs, bbls.	lb.	.03½-.06½
Metasilicate	lb.	.05-.06¼
Nitrate, tech., bbls.	lb.	.03¾-.07
Phosphate, tech., bbls.	lb.	.03¾
Silicate (Water Glass), bbls.	lb.	.01½
Stannate, fluctuating	lb.	.21½
Sulphocyanide	lb.	.30-.45
Sulphur (Brimstone), bbls.	lb.	.02
Tin Chloride, fluctuating, 100 lb. kegs	lb.	.24-.24½
Tripoli, powdered	lb.	.03
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc—Carbonate, bbls.	lb.	.11
Chloride, drums, bbls.	lb.	.07½-.10
Cyanide (100 lb. kegs)	lb.	.38
Sulphate, bbls.	lb.	.03½

STAINLESS STEEL
BUFFING COMPOSITIONS

Keeping pace with developments in Stainless Steel, the McAleer laboratories have originated three new buffing compositions—each superior for its particular purpose from the standpoints of economy and results. Samples on request.

NO. 77
Dry, for small parts

NO. 72-C
Medium dry, for flat parts

NO. 82-A
Medium greasy, for miscellaneous work

McALEER MANUFACTURING COMPANY
DETROIT, MICHIGAN . . . WALKERVILLE, ONTARIO

"Insist on McAleer's!"

MAIL THE COUPON—NOW—FOR FREE SAMPLES

McAleer Manufacturing Co., 7401 Lyndon Ave., Detroit, Michigan

Gentlemen: Please send free sample of your_____. It is understood this will not obligate us in any way.

Firm Name_____ City and State_____

Street Address_____ Requested by_____

METAL INDUSTRY

With Which Are Incorporated
COPPER AND BRASS
BRASS FOUNDER AND FINISHER
ALUMINUM WORLD
ELECTRO-PLATERS' REVIEW

Address all correspondence to Metal Industry, 116 John St., New York. Telephone, BEekman 3—0404. Cable Address Metalustry.

PALMER H. LANGDON...Editor and Publisher
ADOLPH BREGMAN.....Managing Editor
THOMAS A. TRUMBOUR.....Business Manager
EVAN J. ROBINSON.....Advertising Manager

Member of Audit Bureau of Circulations and The Associated Business Papers

Published Monthly—Copyright 1933 by The Metal Industry Publishing Company, Incorporated; Entered February 10, 1903, at New York, N. Y., as second class matter under Act of Congress, March 3, 1879.

SUBSCRIPTION PRICES: United States, $2.00 Per Year; Canada and Foreign, $2.50. SINGLE COPIES, 20 CENTS. Please remit by check or money order; Cash should be registered. Advertising Rates on Application. Forms Close the First of the Month.

Vol. 31 MARCH, 1933 No. 3

TABLE OF CONTENTS

Institute of Metals Division Meeting 85
Winter Meeting Held in New York. Papers on Theoretical Metallurgy, Practical Metallurgy, Aluminum, Platinum and Gases in Metals.

The Casting of Two Huge Doors in Bronze 90
By E. H. LANDOLT

Fluxes in Brass Melting 91
A Review of the Many Fluxes in Use, Their Purposes and Their Limitations.
By WERNER FROHLICH

Sheet Metal Workers' Problems 93
By W. B. FRANCIS

Black Dips 93
By OLIVER J. SIZELOVE

The Electrodeposition of Tungsten from Aqueous Alkaline Solution 94
It Is Quite Commonly Recognized That a Satisfactory Coating of Electroplated Tungsten Would Be Specially Valuable as a Protection for Base Metals As Well as for Ornamental Purposes. Tungsten Is Resistant to Ordinary Acids and Other Chemical Reagents.
By M. LESLIE HOLT and LOUIS KAHLENBERG.

Sand Casting Jewelry 97
By J. M.

New York Platers' Meeting 98

Measuring Millionth-Inch Creep Metals 99

Porcelain Enamel Blackboard 99

Editorials 100
Metal Progress Continues.
The Dilemma of the Plating Industry.
The Plater—Practical or Technical?
Modernization Pays.
The Banks and Business.
Industrial Planning.

New Books—Technical Papers 102

Shop Problems 103

Patents 105

Equipments 106
Expanding Polishing Wheel.
Rubber Lining for Tanks and Drums.
New Solders.
Potassium Silicate for Welding Flux.
Small Sized Plating Machine.
Synthetic Veneer Provides New Type Metal Coating.
Increased Capacity for Welders.
Solders, Babbitt and Lead.
Baird Automatic Multiple Spindle Grinder.
Photoelectric Control.
Automatic Electric Header with Heating Device.
Geared Motors.

Personals 109

Obituaries 109

News of Associations 111

Industrial and Financial News 112

Metal Market Review 117

The Wrought Metal Market 118

Metal Prices 118

Supply Prices 120

METAL INDUSTRY articles are listed regularly in the "Engineering Index" and "The Industrial Arts Index"

Buyers' Guide, Advertising Page 32